

THE ROAD AHEAD FOR AUTOMATED VEHICLES

(117-39)

REMOTE HEARING
BEFORE THE
SUBCOMMITTEE ON
HIGHWAYS AND TRANSIT
OF THE
COMMITTEE ON
TRANSPORTATION AND
INFRASTRUCTURE
HOUSE OF REPRESENTATIVES
ONE HUNDRED SEVENTEENTH CONGRESS

SECOND SESSION

FEBRUARY 2, 2022

Printed for the use of the
Committee on Transportation and Infrastructure



Available online at: <https://www.govinfo.gov/committee/house-transportation?path=/browsecommittee/chamber/house/committee/transportation>

U.S. GOVERNMENT PUBLISHING OFFICE

47-612 PDF

WASHINGTON : 2022

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Washington, DC 20515

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JANUARY 31, 2022

SUMMARY OF SUBJECT MATTER

TO: Members, Subcommittee on Highways and Transit
FROM: Staff, Subcommittee on Highways and Transit
RE: Subcommittee Hearing on “The Road Ahead for Automated Vehicles”

PURPOSE

The Subcommittee on Highways and Transit will meet on Wednesday, February 2, 2022, at 11:00 a.m. in 2167 Rayburn House Office Building and virtually via Zoom to receive testimony related to the hearing entitled “The Road Ahead for Automated Vehicles.” The purpose of this hearing is for Members of the Subcommittee to explore the impact of automated vehicle deployment, including automated trucks and buses, on mobility, infrastructure, safety, workforce, and other economic and societal implications or benefits. The Subcommittee will hear from representatives of the National League of Cities, American Association of State Highway and Transportation Officials, Advocates for Highway and Auto Safety, University of Oregon, Transport Workers Union of America, Autonomous Vehicle Industry Association, Teamsters, and Aurora.

BACKGROUND

Automated vehicles (AVs), including automated trucks and buses, are vehicles in which the safety-critical control functions (e.g., steering, acceleration, or braking) can occur without direct driver input.¹ There are at least 1,400 automated vehicles, including automated trucks, currently in testing by more than 80 companies across 36 states, according to the U.S. Department of Transportation (DOT).²

AV TECHNOLOGY

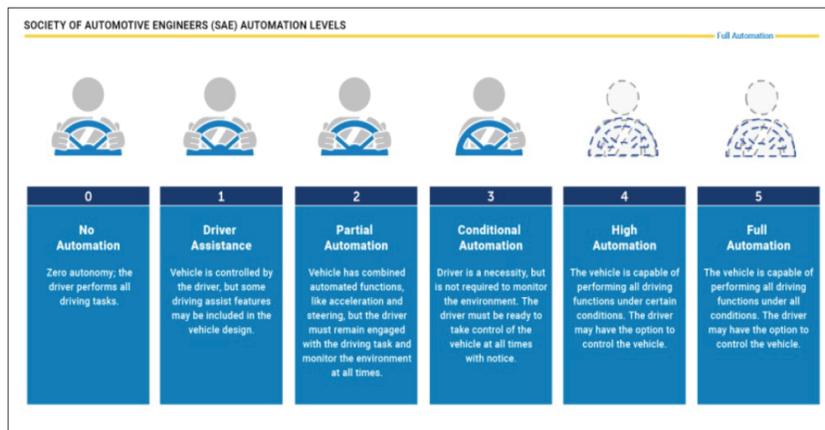
The Society of Automotive Engineers (SAE) classifies vehicle automation into six levels. The levels of automation are as follows:³

- Level 0: No Driving Automation
- Level 1: Driver Assistance
- Level 2: Partial Driving Automation
- Level 3: Conditional Driving Automation
- Level 4: High Driving Automation
- Level 5: Full Driving Automation

¹ National Highway Traffic Safety Administration, Automated Vehicles, <https://one.nhtsa.gov/Research/Crash-Avoidance/Automated-Vehicles>. Accessed January 18, 2022.

² Darrell Etherington, “Over 1,400 self-driving vehicles are now in testing by 80+ companies across the US,” *Tech Crunch*, June 11, 2019, <https://tcrn.ch/3fUunoP>. Accessed January 18, 2022.

³ SAE International, Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles (J3016_202104), Revised April 30, 2021, https://www.sae.org/standards/content/j3016_202104/. Accessed January 18, 2022.



Source: National Highway Traffic Safety Administration (<https://bit.ly/34dUqVI>)

Only vehicles equipped with levels 3, 4, or 5 automation are considered automated vehicles. The combination of hardware and software that automates control functions of AVs is called the automated driving system (ADS).⁴ Vehicles with levels 0–2 automation are considered equipped with automated driver assistance systems (ADAS). Many vehicles available today are equipped with some automation (levels 1–2), which includes features such as automatic emergency braking and lane centering.⁵ Although vehicles equipped with level 3–5 automation are not yet commercially available, many trucking companies have partnered with self-driving technology firms and are testing trucks with level 4 service and some jurisdictions are providing level 4 autonomous transit service.⁶

The conditions and scenarios under which an AV can safely operate is called an operational design domain (ODD).⁷ These conditions may include geographies, roadway types, speed range, weather, and time of day.⁸ AVs with more limited ODDs, such as automated long-haul trucks operating only on Interstate highways, may be closer to deployment. Conversely, AVs with more complex ODDs, such as automated passenger vehicles operating in dense urban areas, have a more complex path to deployment.

In place of a human driver, AVs “see” the road using a complex, complementary suite of technologies that work together to paint a picture of their environment.⁹ Examples of these technologies may include the following:¹⁰

- LiDAR: uses light to detect objects and distances.
- Radar: uses electromagnetic waves to detect objects and movement.
- Vision systems: uses cameras to capture the surrounding environment and important objects, such as traffic lights, construction zones, school buses, and the lights of emergency vehicles.
- Computers: processes images captured by cameras to discern between objects.

⁴National Highway Traffic Safety Administration, Automated Vehicles for Safety, <https://bit.ly/33L01TA>. Accessed January 18, 2022.

⁵SAE International, “SAE Levels of Driving Automation™ Refined for Clarity and International Audience,” May 3, 2021, <https://www.sae.org/blog/sae-j3016-update>. Accessed January 18, 2022.

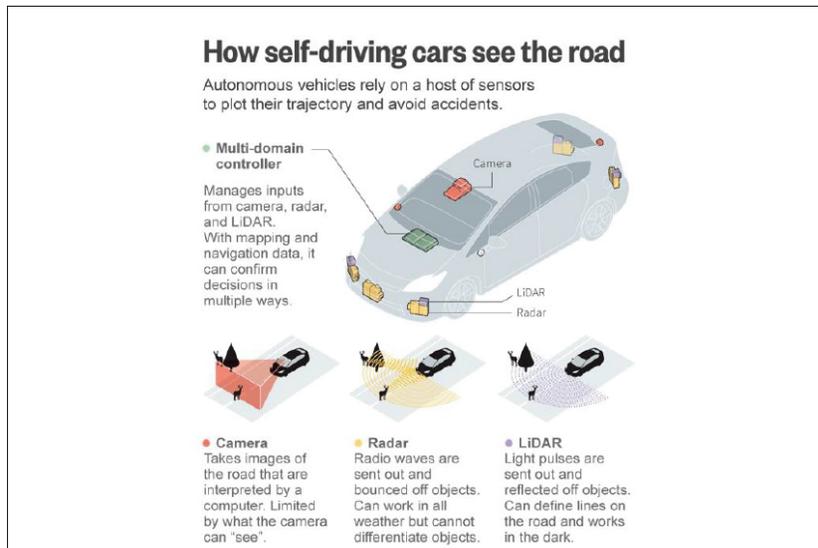
⁶<https://bit.ly/3ofrC6m> ; <https://bit.ly/3IOhU2w> ; <https://bit.ly/3IVHADL>

⁷Waymo, “Waymo Safety Report,” page 16, February 2021. <https://bit.ly/33KBb6j>. Accessed January 18, 2022.

⁸Ibid.

⁹Ibid, page 14.

¹⁰Ibid.



Source: World Economic Forum (<https://bit.ly/3rWYwCP>)

Similar to automated vehicles, connected vehicles (CVs) operate by transmitting radio signals that allow CVs to communicate with both other CVs and the surrounding environment.¹¹ CVs utilize the 5.9 gigahertz radio frequency band to enable vehicle-to-everything (V2X) communications through a technology called dedicated short-range communications (DSRC).¹² Connected vehicle technology is largely different than automated vehicle technology, but the two technologies may eventually merge and complement one another. Connected vehicles are not yet broadly commercially available, and the technology is still in development. In 1999, the Federal Communications Commission (FCC) reserved 75 MHz in the 5.9 GHz spectrum band for DSRC for use with Intelligent Transportation Systems (ITS) to develop and test technologies that increase roadway safety.¹³ In November 2020, the FCC authorized unlicensed Wi-Fi devices to share more than half of the 5.9 GHz band, reducing the amount of spectrum available for V2X devices to 30 MHz.¹⁴ This controversial action was criticized by members of the Committee on Transportation and Infrastructure,¹⁵ State Departments of Transportation, and the Intelligent Transportation Society of America.¹⁶ At that time, DOT stated that the FCC's decision "suffers from numerous deficiencies."¹⁷

¹¹ U.S. Department of Transportation, *How Connected Vehicles Work*, Updated February 27, 2020, <https://www.transportation.gov/research-and-technology/how-connected-vehicles-work>. Accessed January 23, 2022.

¹² *Ibid.*

¹³ Federal Communications Commission, "Defining Safety of Life in 5.9 GHz," Michael O'Rielly, Commissioner, June 8, 2016, available at <https://www.fcc.gov/news-events/blog/2016/06/08/defining-auto-safety-life-59-ghz>. Accessed January 27, 2022.

¹⁴ Federal Communications Commission, "First Report and Order, Further Notice of Proposed Rulemaking, and Order of Proposed Modification in the Matter of the Use of the 5.850–5.925 GHz Band," ET Docket No. 19–138. November 18, 2020. <https://www.fcc.gov/document/fcc-modernizes-59-ghz-band-improve-wi-fi-and-automotive-safety-0>. Accessed January 23, 2022.

¹⁵ Letter to the DOT from the Committee on Transportation and Infrastructure. 2020–01–22 Full TI Letter to FCC.pdf (house.gov). Accessed January 26, 2022.

¹⁶ Traffic Technology Today Website, "ITS America and AASHTO ask US Transportation Secretary to preserve 5.9 GHz spectrum for V2X" March 16, 2021. available at ITS America and AASHTO ask US Transportation Secretary to preserve 5.9 GHz spectrum for V2X—Traffic Technology Today. Accessed January 26, 2022.

¹⁷ U.S. Department of Transportation, Comments in the Federal Register, "First Report and Order, Further Notice of Proposed Rulemaking, and Order of Proposed Modification in the Matter of the Use of the 5.850–5.925 GHz Band," ET Docket No. 19–138, November 6, 2020, page 1, <https://bit.ly/344O0YL>. Accessed January 23, 2022.

MOBILITY

AV technology has the potential to revolutionize mobility and make the transport of goods and people easier, cheaper, more efficient, and more accessible.¹⁸ AVs could improve mobility for vulnerable groups, including the elderly and those with disabilities.¹⁹ Adoption of AVs may provide options to those facing transportation challenges, increasing their access to jobs and services and their ability to live independently.²⁰ Expanding transportation options for underrepresented communities may address one of the major barriers to entry for enhanced equality and inclusion in society.²¹ In addition, AVs may also facilitate quicker and cheaper freight transportation.²²

INFRASTRUCTURE AND AVS

Because AVs will “see” the road differently, transportation officials are beginning to evaluate the role of road infrastructure in the safe deployment of AVs.

Stakeholders have noted that roadways and traffic control devices—which include signs and lane markings—will likely need to be in a state of good repair for safe AV operation.²³ For example, today’s AV technology may be unable to accurately read, interpret, and take the proper action in the presence of potholes, unclear road signage, or faded lane markings.²⁴ Similarly, traffic control devices today are not uniform across all states and are designed for humans to interpret.²⁵ Different states and regions use different kinds of traffic control devices.²⁶ It is unclear how AVs and their technologies—which vary between companies—may develop to interpret disparate signs and lane markings in the future.²⁷

The Federal Highway Administration (FHWA) is in the early stages of evaluating the role of infrastructure in the deployment of AVs and what federal action may be necessary. This includes researching what data is needed for updating infrastructure, modeling how AVs may impact traffic operations, and awarding grants to allow states and localities to pursue their own research.²⁸

FHWA is also in the process of updating the national Manual on Uniform Traffic Control Devices (MUTCD) to account for AVs. The national MUTCD is a manual developed by FHWA that sets minimum standards and provides guidance for traffic

¹⁸JTL Urban Mobility Lab at MIT, Autonomous Vehicles and Cities, *available at* <https://mobility.mit.edu/av>.

¹⁹National Highway Traffic Safety, Automated Vehicles for Safety, *available at* <https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety>. Accessed January 26, 2022.

²⁰U.S. Department of Transportation and National Science & Technology Council, “Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0,” January 2020, page 8, *available at* <https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/360956/ensuringamericanleadershipav4.pdf>. Accessed January 24, 2022.

²¹Automotive World, Automated vehicles: the opportunity to create an inclusive mobility system, March 27, 2019, *available at* <https://www.automotiveworld.com/articles/automated-vehicles-the-opportunity-to-create-an-inclusive-mobility-system/#:~:text=Automated%20vehicles%20are%20expected%20to%20improve%20mobility%20and,mobility%20today%20C%20existing%20mobility%20issues%20may%20be%20amplified.> Accessed January 26, 2022.

²²Driving Automation Systems in Long-Haul Trucking and Bus Transit: Preliminary Analysis of Potential Workforce Impacts (transportation.gov) page 9, *available at* Driving Automation Systems in Long-Haul Trucking and Bus Transit: Preliminary Analysis of Potential Workforce Impacts (transportation.gov). Accessed January 27, 2022.

²³Connected and Autonomous Vehicles Impacts Committee of the American Society of Civil Engineers, Comments in the Federal Register, “Automated Driving Systems,” Docket No. FHWA-2017-0049, March 5, page 3, <https://www.regulations.gov/comment/FHWA-2017-0049-0079>. Accessed January 20, 2022.

²⁴American Traffic Safety Services Association, Comments in the Federal Register, “Automated Driving Systems,” Docket No. FHWA-2017-0049, March 5, page 2, <https://www.regulations.gov/comment/FHWA-2017-0049-0067>. Accessed January 20, 2022.

²⁵Ibid.

²⁶Ibid.

²⁷Connected and Autonomous Vehicles Impacts Committee of the American Society of Civil Engineers, Comments in the Federal Register, “Automated Driving Systems,” Docket No. FHWA-2017-0049, March 5, page 4, <https://www.regulations.gov/comment/FHWA-2017-0049-0079>. Accessed January 20, 2022.

²⁸U.S. Department of Transportation and National Science & Technology Council, “Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0,” January 2020, page 21, <https://www.transportation.gov/sites/dot.gov/files/2020-02/EnsuringAmericanLeadershipAVTech4.pdf>. Accessed January 21, 2022; Federal Highway Administration, “Automated Driving Systems,” Docket No. FHWA-2017-0049, January 18, 2018, <https://www.regulations.gov/document/FHWA-2017-0049-0001>. Accessed January 21, 2022.

control devices.²⁹ In December 2020, FHWA published a Notice of Proposed Rulemaking (NPRM) to amend the MUTCD with, among other modifications, new guidance focused on accommodating AVs.³⁰ This rulemaking is currently underway, and the comment period closed on May 14, 2021.³¹

SAFETY AND FEDERAL ACTIONS

Automated vehicles have the potential to drastically increase vehicle safety and reduce motor vehicle crashes and deaths. In 2020, there were 38,680 people killed in motor vehicle crashes on U.S. roadways.³² Despite an initial drop in the number of vehicle miles traveled, traffic fatalities have increased dramatically since the start of the COVID-19 pandemic. Early estimates show that 20,160 people died in the first half (January–June) of 2021, an increase of 18.4 percent over the same time period in 2020.³³ This represents the largest number of projected fatalities in the first half of the year since 2006 and the highest half-year percentage increase in the history of data recorded, according to the National Highway Traffic Safety Administration (NHTSA).³⁴

DOT's research has indicated that up to 94 percent of serious crashes involve human factors.³⁵ However, the Chair of the National Transportation Safety Board (NTSB) has recently criticized that statistic as “misleading.”³⁶ AVs can mitigate or correct driver error, and level 5 AVs have the potential to remove the need for a human driver from the chain of events that can lead to a crash. Provided that AVs respond appropriately to avoid a crash, this heralds the potential to significantly increase safety for drivers, passengers, and other road users; and reduce the economic costs of crashes.³⁷ Trucking and technology firms are currently testing the technology to ensure that AVs can and will respond appropriately in complex traffic and varying roadway conditions.

Because automated vehicles are still in development, AV regulatory regimes are still in their beginning stages.³⁸ At the federal level, automated vehicle safety is overseen by NHTSA. Although there is no overarching federal framework for automated vehicles, DOT has taken preliminary steps to adapt its regulatory regime for AVs. Since 2016, DOT has released several iterations of voluntary guidance for AVs, the latest being the “Automated Vehicles Comprehensive Plan” and “Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0.”³⁹ In December 2020, NHTSA published an Advance Notice of Proposed Rulemaking (ANPRM) seeking public comment on the potential development of a framework of principles to govern AV safety.⁴⁰

Because private companies are in the early stages of developing, testing, and piloting AVs and AV technologies, there is little publicly available data on collision rates and vehicle safety.⁴¹ NHTSA encourages automated vehicle manufacturers to

²⁹ Federal Highway Administration, Manual on Uniform Traffic Control Devices, “Overview,” <https://mutcd.fhwa.dot.gov/kno-overview.htm>. Accessed January 21, 2022.

³⁰ Federal Highway Administration, “National Standards for Traffic Control Devices: Manual on Uniform Traffic Control Devices for Streets and Highways; Revision,” Docket No. FHWA-2020-0001, December 14, 2020, <https://www.regulations.gov/document/FHWA-2020-0001-0001>. Accessed January 21, 2022.

³¹ Federal Highway Administration, “National Standards for Traffic Control Devices; the Manual on Uniform Traffic Control Devices for Streets and Highways; Revision,” Docket No. FHWA-2020-0001, February 2, 2021, <https://www.federalregister.gov/documents/2021/02/02/2021-01440/national-standards-for-traffic-control-devices-the-manual-on-uniform-traffic-control-devices-for>. Accessed January 27, 2022.

³² <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813199>. Accessed January 30, 2022.

³³ *Ibid.*

³⁴ *Ibid.*

³⁵ <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812456>. Accessed January 30, 2022.

³⁶ <https://www.ttnews.com/articles/ntsbs-homendy-calls-dots-serious-crash-stat-misleading>.

³⁷ National Highway Traffic Safety Administration, Automated Vehicles for Safety, *available at* National Highway Traffic Safety Administration, Automated Vehicles for Safety—NHTSA. Accessed on January 26, 2022.

³⁸ U.S. Department of Transportation and National Science & Technology Council, “Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0,” January 2020, page 7, <https://www.transportation.gov/sites/dot.gov/files/2020-02/EnsuringAmericanLeadershipAVTech4.pdf>. Accessed January 23, 2022.

³⁹ *Ibid.*

⁴⁰ National Highway Traffic Safety Administration, “Framework for Automated Driving System Safety,” Docket No. NHTSA-2020-0106, December 3, 2020, <https://www.regulations.gov/document/NHTSA-2020-0106-0001>. Accessed January 23, 2022.

⁴¹ U.S. Department of Transportation and National Science & Technology Council, “Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0,” January

submit Voluntary Safety Self-Assessments (VSSAs) demonstrating their approaches to safe testing and deployment of AVs.⁴² To date, 29 companies have submitted VSSAs to NHTSA.⁴³ NHTSA also encourages AV companies to voluntarily disclose information, including location and type of vehicle, through the Automated Vehicle Transparency and Engagement for Safe Testing (AV TEST) tracking tool.⁴⁴ All of this information is publicly available. In June 2021, NHTSA issued a Standing General Order that requires AV manufacturers and operators to report crashes to the agency.⁴⁵

The Federal Motor Carrier Safety Administration (FMCSA) establishes Federal Motor Carrier Safety Regulations (FMCSRs), which set minimum safety standards for motor carriers and drivers.⁴⁶ In May 2019, FMCSA released an ANPRM requesting comment on FMCSRs that may need to be updated, modified, or eliminated to facilitate the safe introduction of automated commercial motor vehicles.⁴⁷ Potentially affected FMCSRs included Licensing and Driver Qualifications, Hours of Service, and Safe Driving.⁴⁸ The NPRM is currently under internal agency review.⁴⁹

STATE AND LOCAL ACTIONS

In lieu of a federal AV framework, 41 states and the District of Columbia have enacted legislation or issued executive orders related to AVs.⁵⁰ Most of these state actions are intended to encourage AV development and testing.⁵¹ Some of these actions incorporate AVs into the state's broader regulatory framework, including operating authorities, safety standards, licensing and registration requirements, and liability laws.⁵²

WORKFORCE IMPACTS

While it is difficult to determine the exact impact AVs will have on the nation's workforce, automating the task of driving commercial motor vehicles could dramatically change professional driving careers in numerous ways. Impacts could include job displacement, changes in job responsibilities, and changes in wages and quality of life.⁵³ According to DOT analysis, the primary economic motivation for adoption of advanced AV technology (e.g., level 5) is to remove the need for a human driver and thereby reduce operating costs.⁵⁴

According to DOT estimates, the current size of the heavy truck and tractor-trailer driver workforce is approximately 2 million drivers, making it one of the largest

2020, page 7, <https://www.transportation.gov/sites/dot.gov/files/2020-02/EnsuringAmericanLeadershipAVTech4.pdf>. Accessed January 23, 2022.

⁴² National Highway Traffic Safety Administration, "Automated Driving Systems 2.0: A Vision for Safety," September 2017, page 7, https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf. Accessed January 23, 2022.

⁴³ National Highway Traffic Safety Administration, Voluntary Safety Self-Assessment, <https://www.nhtsa.gov/automated-driving-systems/voluntary-safety-self-assessment>. Accessed January 23, 2022.

⁴⁴ National Highway Traffic Safety Administration, AV TEST Initiative, <https://www.nhtsa.gov/automated-vehicle-test-tracking-tool>. Accessed January 23, 2022.

⁴⁵ National Highway Traffic Safety Administration, Standing General Order on Crash Reporting for Levels of Driving Automation 2–5, <https://www.nhtsa.gov/laws-regulations/standing-general-order-crash-reporting-levels-driving-automation-2-5>. Accessed January 23, 2022.

⁴⁶ Federal Motor Carrier Safety Administration, "What Are Federal Motor Carrier Safety Regulations (FMCSRs) and Hazardous Materials Regulations (HMRs) and Where are They Published?", The Motor Carrier Safety Planner, <https://bit.ly/3nWFJwY>.

⁴⁷ Federal Motor Carrier Safety Administration, "Automated Driving Systems (ADS) for Commercial Motor Vehicles (CMVs): Request for Comments Concerning Federal Motor Carrier Safety Regulations (FMCSRs) Which May Be a Barrier to the Safe Testing and Deployment of ADS-Equipped CMVs on Public Roads," Docket No. FMCSA–2018–0037, March 26, 2018, <https://www.regulations.gov/docket/FMCSA-2018-0037>. Accessed January 23, 2022.

⁴⁸ Federal Motor Carrier Safety Administration, "Automated Driving Systems (ADS) Policy Development for Commercial Vehicle Operations," March 10, 2021, page 5, <https://bit.ly/3AAkMNx>. Accessed January 23, 2022.

⁴⁹ *Ibid.*, page 6.

⁵⁰ National Conference of State Legislatures, Autonomous Vehicles State Bill Tracking Database, Updated January 12, 2022, <https://www.ncsl.org/research/transportation/autonomous-vehicles-legislative-database.aspx>. Accessed January 23, 2022.

⁵¹ *Ibid.*

⁵² *Ibid.*

⁵³ U.S. Department of Transportation, "Driving Automation Systems in Long-Haul Trucking and Bus Transit: Preliminary Analysis of Potential Workforce Impacts," January 2021, page 9, <https://bit.ly/3AKXPHP>. Accessed January 24, 2022.

⁵⁴ *Ibid.*, page 42.

occupational sectors in the U.S.⁵⁵ The American Trucking Associations estimates that the industry needs 80,000 more drivers today with those estimates expected to surpass 160,000 drivers by 2030.⁵⁶ Other segments of the industry cite driver retention as the workforce challenge most plaguing the industry, highlighting driver wages and working conditions as obstacles to attracting and retaining qualified drivers.⁵⁷ These groups point to U.S. Department of Labor analysis of trucking industry turnover rates,⁵⁸ as well as FMCSA estimates that over 400,000 commercial driver's licenses are issued each year.⁵⁹ Some segments of the trucking industry view driving automation and the possible quality of life improvement as having the potential to help address the estimated demand for new truck drivers in the long-haul trucking segment.⁶⁰

The adoption of automation technologies has historically been associated with some level of job displacement. Potential trucking workforce job displacement is unknown at this point and may vary based on several factors. DOT analysis notes that displacement would be limited for business models in which a driver remains in the vehicle, regardless of their onboard duties.⁶¹ Increased adoption of low-level automation (e.g., levels 1, 2, and 3) is unlikely to bring about driver job displacement but may lead to improvements in safety and operations and quality of life.⁶² In the long term, the adoption of Level 4 or 5 AVs may supplant certain driving tasks and reduce the need for human drivers, displacing workers and creating periods of transitional unemployment for some affected workers.⁶³ Within the trucking sector, job displacement may be experienced first in the long-haul sector due to the long periods of uninterrupted highway driving (a less complex driving task to automate).⁶⁴ Researchers have attempted to estimate the impact of AVs on trucking job displacement. Some studies show that job displacement estimates may vary from a low-end of 19 to 25 percent up to 60 to 65 percent of all heavy truck and tractor-trailer driver jobs; however, these estimates should be reexamined as they may be limited by the need for new and additional data.⁶⁵ Other studies contradict the finding that automation will result in job losses.⁶⁶ Additionally, certain portions of long haul trucking may be more vulnerable to displacement because of a less complex operating environment on highways.⁶⁷

However, the more advanced driving automation systems may spur increased demand for complementary occupations and create new jobs separate from manual truck driving. For example, additional, highly skilled mechanics would be required to maintain and repair the increasingly complex technologies.⁶⁸ In addition, experienced drivers could be employed at trucking control centers that remotely pilot trucks.⁶⁹

⁵⁵ U.S. Department of Transportation, "Driving Automation Systems in Long-Haul Trucking and Bus Transit: Preliminary Analysis of Potential Workforce Impacts," January 2021, page 38, <https://bit.ly/3AKXPHP>. Accessed January 24, 2022.

⁵⁶ Transport Topics, "Truck Driver Shortage Looms over 2022," December 22, 2021, *available at* <https://www.ttnews.com/articles/truck-driver-shortage-looms-over-2022>. Accessed January 26, 2022.

⁵⁷ Todd Spencer, Owner-Operator Independent Drivers Association, Testimony to House Committee on Transportation and Infrastructure, June 12, 2019, <https://docs.house.gov/meetings/PW/PW12/20190612/109600/HHRG-116-PW12-Wstate-SpencerT-20190612.pdf>. Accessed January 26, 2022.

⁵⁸ U.S. Department of Labor, "Is the U.S. labor market for truck drivers broken?," March 2019, <https://www.bls.gov/opub/mlr/2019/article/is-the-us-labor-market-for-truck-drivers-broken.htm>. Accessed January 26, 2022.

⁵⁹ FreightWaves, "OOIDA urges Biden administration to bust driver shortage 'myth'," August 2021, <https://www.freightwaves.com/news/oida-urges-biden-administration-to-bust-driver-shortage-myth>. Accessed January 26, 2022.

⁶⁰ Driving Automation Systems in Long-Haul Trucking and Bus Transit: Preliminary Analysis of Potential Workforce Impacts (transportation.gov) page 39; Three Major Benefits of Autonomous Trucking : Redwood Logistics. Accessed January 26, 2022.

⁶¹ *Ibid.*, page 42.

⁶² *Ibid.*, page 38 and 45.

⁶³ *Ibid.*

⁶⁴ *Ibid.*, page 63.

⁶⁵ *Ibid.*

⁶⁶ Harvard Business Review, Automation Isn't About to Make Truckers Obsolete, Maurey Gittleman and Kristen Monaco, September 18, 2019, *available at* <https://hbr.org/2019/09/automation-isnt-about-to-make-truckers-obsolete>. Accessed January 29, 2022.

⁶⁷ Driving Automation Systems in Long-Haul Trucking and Bus Transit: Preliminary Analysis of Potential Workforce Impacts (transportation.gov) page 63; And Three Major Benefits of Autonomous Trucking : Redwood Logistics. Accessed January 26, 2022.

⁶⁸ *Ibid.*, page 41.

⁶⁹ *Ibid.*, page 44.

According to the National Transit Database, there were approximately 102,000 transit bus drivers in the U.S. in 2020.⁷⁰ However, transit agencies across the nation are reporting bus driver shortages, which threaten the ability of transit agencies to resume pre-pandemic operations.⁷¹ Agencies have had to cut transit service to cope, resulting in hardships for those that depend on bus transit to get to work, school, or shopping to access other services.⁷² Fully automating transit operator jobs is likely to be difficult due to the complexity of the environments in which transit buses operate. At high levels of automation, transit agencies may elect to replace bus driver positions with service-oriented roles such as “non-driving onboard attendants” who would be responsible for tasks that are difficult to automate, such as collecting fares and securing wheelchairs.⁷³ However, these positions may be lower-skilled and may receive lower pay and benefits since the driving component and Commercial Driver’s License credential requirement would be eliminated. Alternatively, AVs may create new job opportunities for transit workers in the logistics arena, such as control center staff to provide remote supervision and dispatch services.⁷⁴

ECONOMICS AND SOCIETAL IMPLICATIONS AND BENEFITS

Beyond increased mobility and safety, the broad adoption of AVs may bring numerous potential benefits to the American public. For example, the increase in safety could provide society with significant benefits in avoiding the deaths, injuries, and other human costs associated with truck and bus crashes.⁷⁵ While many crash impacts are intangible, trucking firms and transit agencies could also realize direct cost savings from reduced repair and maintenance costs, insurance premiums, and vehicle downtime.⁷⁶

Reducing crashes and their resulting delays will increase the efficiency of bus and truck operations and increase the capacity and throughput on our roads.⁷⁷ Traffic optimization, a potential benefit of AVs if they respond appropriately to traffic conditions, is likely to reduce commuting times.⁷⁸ In addition, AVs have the potential to improve fleet utilization. For example, without a human driver, trucks could potentially run more continuously, without the need for human drivers to rest.⁷⁹ Like-

⁷⁰This information was provided to the Committee by the Federal Transit Administration via email on January 27, 2022.

⁷¹National Public Radio, “A shortage of bus drivers is causing problems for those who use public transportation” January 17, 2022. *available at* <https://www.npr.org/2022/01/17/1073661319/a-shortage-of-bus-drivers-is-causing-problems-for-those-who-use-public-transport>; <https://www.wkbw.com/news/local-news/transit-union-president-says-nfta-bus-driver-shortage-is-wage-not-pandemic-related#:~:text=Transit%20Union%20president%20says%20NFTA%20bus%20driver%20shortage,benefits%2C%20as%20well%20as%20pension%20and%20post-retirement%20benefits>; <https://www.mercurynews.com/2021/12/29/bay-area-transit-looks-to-woo-new-bus-operators-amid-national-driver-shortage/>; <https://minnesota.cbslocal.com/2021/09/20/metro-transit-route-cancellations/>; <https://www.koin.com/local/multnomah-county/trimet-to-limit-bus-service-amid-agencys-worst-ever-driver-shortage/>; <https://www.wusa9.com/article/news/local/dc/metry-bus-driver-shortage-route-delays/65-3b47feb-a065-4a5a-9471-6d45864c388b>; <https://www.thecity.nyc/2021/5/24/22452250/mta-bus-driver-shortage-canceled-trips-and-waits>; <https://minnesota.cbslocal.com/2021/09/20/metro-transit-route-cancellations/>; Accessed January 25, 2022

⁷² *Ibid.*

⁷³ Driving Automation Systems in Long-Haul Trucking and Bus Transit: Preliminary Analysis of Potential Workforce Impacts (transportation.gov) page 58, *available at* Driving Automation Systems in Long-Haul Trucking and Bus Transit: Preliminary Analysis of Potential Workforce Impacts (transportation.gov). Accessed January 29, 2022.

⁷⁴ *Ibid.*, page 59.

⁷⁵ U.S. Department of Transportation, “Driving Automation Systems in Long-Haul Trucking and Bus Transit: Preliminary Analysis of Potential Workforce Impacts,” January 2021, page 40, <https://www.transportation.gov/sites/dot.gov/files/2021-01/Driving%20Automation%20Systems%20in%20Long%20Haul%20Trucking%20and%20Bus%20Transit%20Preliminary%20Analysis%20of%20Potential%20Workforce%20Impacts.pdf>. Accessed January 26, 2022.

⁷⁶ *Ibid.*

⁷⁷ IEEE.org, Decision-Making Strategy on Highway for Autonomous Vehicles Using Deep Reinforcement Learning, Liao, Liu, Tang, September 2020, *available at* <https://ieeexplore.ieee.org/document/9190040>. Accessed January 29, 2022.

⁷⁸ Science Direct, Will autonomous vehicles change auto commuters’ value of travel time?, Zhong, Li, Burris, *available at* <https://www.sciencedirect.com/science/article/abs/pii/S1361920919311010#:~:text=Autonomous%20vehicles%20could%20reduce%20commuters%E2%80%99%20value%20of%20travel,commuters%2C%20followed%20by%20their%20urban%20and%20rural%20counterparts>. Accessed January 29, 2022.

⁷⁹ Driving Automation Systems in Long-Haul Trucking and Bus Transit: Preliminary Analysis of Potential Workforce Impacts (transportation.gov) page 44, *available at* Driving Automation Systems in Long-Haul Trucking and Bus Transit: Preliminary Analysis of Potential Workforce Impacts (transportation.gov). Accessed January 29, 2022.

wise, longitudinal control systems on buses can increase throughput in congested conditions.⁸⁰ Precision docking can improve the customer experience, particularly for passengers with disabilities, while also reducing waiting times.⁸¹ AVs could also improve vehicle utilization, as a potential bidirectional design can eliminate end-of-run turnaround loops, and there would be no need for operator breaks.⁸²

Fuel costs are the second highest cost category for the trucking industry.⁸³ AVs may reduce the amount of fuel required, thereby significantly reducing fuel costs and benefitting the environment.⁸⁴ Truck platooning, which uses automation to allow trucks to follow each other at a set distance between trucks, allows trucks to travel closer together and offers potential improvements in overall fuel economy.⁸⁵ A study shows that platooning with automated trucks can reduce fuel consumption by 10 to 25 percent and reduce emissions.⁸⁶

Potential increases in productivity resulting from AVs may result in faster delivery and quicker commuting time.⁸⁷ Productivity increases together with operational savings may result in lower trucking freight rates that may be passed on to the consumer⁸⁸.

Beyond the potential direct benefits of AVs, researchers are beginning to investigate the broader societal implications of AVs. These include the effect of AVs on greenhouse gas emissions, congestion, urban design, and equity.⁸⁹ Some research suggests that AVs may not uniformly alleviate congestion.⁹⁰ Additionally, some studies suggest that AVs may increase greenhouse gas emissions because they provide easier access to travel and mobility.⁹¹ Further research is needed to conclusively identify the effects of AVs on congestion and greenhouse gas emissions.

WITNESS LIST

- The Honorable Martha Castex-Tatum, Vice Mayor Pro Tem and Councilmember, District K (Houston, TX), *on behalf of the National League of Cities*
- Mr. Scott Marler, Director, Iowa Department of Transportation, *on behalf of the American Association of State Highway and Transportation Officials*
- Mr. John Samuelson, International President, Transport Workers Union of America
- Ms. Catherine Chase, President, Advocates for Highway and Auto Safety
- Mr. Nat Beuse, Vice President of Safety, Aurora
- Mr. Doug Bloch, Political Director, Teamsters Joint Council 7
- Mr. Nico Larco, Professor and Director of the Urbanism Next Center, University of Oregon
- Mr. Ariel Wolf, Esq., General Counsel, Autonomous Vehicle Industry Association

⁸⁰ Ibid, page 54.

⁸¹ Ibid.

⁸² Ibid.

⁸³ Ibid, page 39.

⁸⁴ Ibid, page 38 and 39.

⁸⁵ Ibid, page 13 and 86.

⁸⁶ Global Trade, "Vehicle Automation and Carbon Emissions," Peter Buxbaum, December 22, 2016. Accessed January 28, 2022.

⁸⁷ Benefits of Going Driverless with an Autonomous Vehicle—C&D Logistics (cdlogistics.ca). Accessed January 28, 2022.

⁸⁸ National Highway Traffic Safety Administration, page 64, <https://www.nhtsa.gov/press-releases/us-department-transportation-releases-preparing-future-transportation-automated>; <http://smarttransport.solutions/2018/05/29/freight-transportation/#:~:text=Automated%20trucks%20have%20the%20potential%20to%20improve%20efficiency,consumption%2C%20and%20thus%20drives%20truck%20freight%20volume%20up>. Accessed January 28, 2022.

⁸⁹ University of Oregon Urbanism Next, Autonomous Vehicles, <https://www.urbanismnext.org/technologies/autonomous-vehicles>. Accessed January 24, 2022.

⁹⁰ Liam Cummins, et al., "Simulating the effectiveness of wave dissipation by FollowerStopper Autonomous Vehicles," ResearchGate, February 2021, page 23. Available at https://www.researchgate.net/publication/349100553_Simulating_the_effectiveness_of_wave_dissipation_by_FollowerStopper_autonomous_vehicles/link/616e36e2039ba26844664ee2/download. Accessed January 29, 2022.

⁹¹ Moneim Massar, et al., "Impacts of Autonomous Vehicles on Greenhouse Gas Emissions—Positive or Negative?," National Library of Medicine, May 23, 2021. Available at <https://pubmed.ncbi.nlm.nih.gov/34071052/>. Accessed January 29, 2022.

THE ROAD AHEAD FOR AUTOMATED VEHICLES

WEDNESDAY, FEBRUARY 2, 2022

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON HIGHWAYS AND TRANSIT,
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE,
Washington, DC.

The subcommittee met, pursuant to notice, at 11:03 a.m. in room 2167 Rayburn House Office Building and via Zoom, Hon. Eleanor Holmes Norton (Chair of the subcommittee) presiding.

Members present in person: Ms. Norton, Mr. DeFazio, Mr. Garamendi, Mr. Auchincloss, Ms. Newman, Mr. Rodney Davis of Illinois, Mr. Crawford, Mr. Perry, Mr. Rouzer, Mr. Bost, Mr. Westerman, Mr. Stauber, Mr. Burchett, Mr. Guest, and Mr. Nehls.

Members present remotely: Ms. Johnson of Texas, Mr. Johnson of Georgia, Mr. Sean Patrick Maloney of New York, Ms. Brownley, Mr. Lowenthal, Mr. DeSaulnier, Mr. Lynch, Mr. Stanton, Mr. García of Illinois, Mr. Delgado, Mr. Lamb, Ms. Bourdeaux, Ms. Strickland, Mrs. Napolitano, Mr. Huffman, Mr. Carbajal, Ms. Davids of Kansas, Mr. Moulton, Ms. Williams of Georgia, Mr. Cohen, Mr. Gibbs, Mr. Massie, Dr. Babin, Mr. LaMalfa, Mr. Fitzpatrick, Mr. Johnson of South Dakota, Ms. Van Duyne, Mr. Gimenez, and Mrs. Steel.

Ms. NORTON. Good morning, and welcome to the Subcommittee on Highways and Transit's hearing on the future of automated vehicles, known as AVs. I must say, I am particularly interested in this hearing, fascinated by it, because it gets us well beyond roads and bridges.

Today we will examine the effects of the adoption and deployment of AVs on roadway safety, infrastructure, and the commercial driving workforce. We will also consider this committee's role and responsibility overseeing AV deployment to ensure that the highest possible safety standards are met, and that all Americans have access to high-quality, family-wage transportation jobs.

Automated vehicles are on the cusp of transforming our transportation system. AVs, including commercial trucks and buses, are those in which at least some aspect of safety-critical control function occurs without direct driver input. Some can themselves perform all driving tasks and monitor the driving environment.

This technology presents both opportunities and threats. Nationwide, we are experiencing a startling rise in fatalities among drivers and other road users. AVs have the potential to drastically reduce deaths on our roadways by reducing traffic crashes caused by human behavior. Still, safety benefits must be carefully weighed

against risks, especially when deploying commercial and passenger-carrying AVs. We have seen disastrous consequences when automation technology is deployed haphazardly.

To maximize the road safety impact of AVs, we must ensure that these technologies are held to the highest possible safety standards. Such standards must consider the safety of all road users who interact with AVs, including pedestrians and cyclists and those who scoot and use wheelchairs, which is especially critical in urban areas like my own District of Columbia.

AVs must be integrated into our transportation system in a manner that respects America's commercial driving workforce. AVs could significantly improve working conditions for commercial drivers, and increase on-the-job safety. But eliminating the need for a human driver could also result in widespread job displacement if the needs of workers are not prioritized at the outset. Employer transparency, comprehensive regulations, and oversight of AV deployment will be required to create and preserve high-quality, family-wage jobs and good working conditions for Americans whose livelihoods depend on driving.

Thank you to each of our witnesses for being here and offering your unique and much-needed insights for this subcommittee. I look forward to a lively discussion and hearing what our committee can do to maximize the benefits that AVs aim to deliver.

[Ms. Norton's prepared statement follows:]

Prepared Statement of Hon. Eleanor Holmes Norton, a Delegate in Congress from the District of Columbia, and Chair, Subcommittee on Highways and Transit

Welcome to the Subcommittee on Highways and Transit's hearing on the future of automated vehicles, known as AVs. Today, we will examine the effects of the adoption and deployment of AVs on roadway safety, infrastructure and the commercial driving workforce. We will also consider this committee's role and responsibility overseeing AV deployment to ensure that the highest possible safety standards are met and that all Americans have access to high-quality, family-wage transportation jobs.

Automated vehicles are on the cusp of transforming our transportation system. AVs, including commercial trucks and buses, are those in which at least some aspect of a safety-critical control function occurs without direct driver input. Some can themselves perform all driving tasks and monitor the driving environment. This technology presents both opportunities and threats.

Nationwide, we are experiencing a startling rise in fatalities among drivers and other road users. AVs have the potential to drastically reduce deaths on our roadways by reducing traffic crashes caused by human behavior. Still, safety benefits must be carefully weighed against risk, especially when deploying commercial and passenger-carrying AVs. We have seen disastrous consequences when automation technology is deployed haphazardly. To maximize the road safety impact of AVs, we must ensure that these technologies are held to the highest possible safety standards. Such standards must consider the safety of all road users who interact with AVs, including pedestrians and cyclists and those who scoot and use wheelchairs, which is especially critical in urban areas like the District of Columbia.

AVs must also be integrated into our transportation system in a manner that respects America's commercial driving workforce. AVs could significantly improve working conditions for commercial drivers and increase on-the-job safety. But eliminating the need for a human driver could also result in widespread job displacement if the needs of workers are not prioritized at the outset. Employer transparency, comprehensive regulations and oversight of AV deployment will be required to create and preserve high-quality, family-wage jobs and good working conditions for Americans whose livelihoods depend on driving.

Thank you to each of our witnesses for being here today and offering your unique insights. I look forward to a lively discussion and hearing what our committee can do to maximize the benefits that AVs aim to deliver.

Ms. NORTON. I ask unanimous consent that the chair be authorized to declare a recess at any time.

Without objection.

I also ask unanimous consent that Members not on the subcommittee be permitted to sit with the subcommittee at today's hearing and ask questions.

Without objection.

As a reminder, please keep your microphone muted, unless speaking. Should I hear any inadvertent background noise, I will request that the Member please mute the microphone.

To insert a document into the record, please have your staff email it to DocumentsT&I@mail.house.gov.

Now I am pleased to recognize my good friend, the ranking member, Mr. Davis.

Mr. RODNEY DAVIS OF ILLINOIS. Thank you, Chair Norton. And before I begin with my opening comments, can I ask unanimous consent to insert into the record comments from the National Association of Mutual Insurance Companies?

Ms. NORTON. So ordered.

[The information follows:]

◆◆◆◆◆

Letter of February 2, 2022, from Tom Karol, General Counsel Federal, National Association of Mutual Insurance Companies, Submitted for the Record by Hon. Rodney Davis of Illinois

FEBRUARY 2, 2022.

The Honorable ELEANOR HOLMES NORTON,
2136 Rayburn Office Building,
Washington, DC 20515.

The Honorable RODNEY DAVIS,
2079 Rayburn House Office Building,
Washington, DC 20515.

DEAR REPRESENTATIVES,

The National Association of Mutual Insurance Companies (NAMIC) is pleased to offer comments to the House of Representatives Subcommittee on Highways and Transit Hearing on “The Road Ahead for Automated Vehicles.”

NAMIC membership includes more than 1,500 member companies. The association supports regional and local mutual insurance companies on main streets across America and many of the country's largest national insurers. NAMIC member companies write \$323 billion in annual premiums. Our members account for 67 percent of homeowners, 55 percent of automobile, and 32 percent of the business insurance markets.

According to the most recent projections from the National Highway Traffic Safety Administration, an estimated 31,720 people died in motor vehicle traffic crashes in the first nine months of 2021, up from 28,325 during the same period in 2020, and 26,941 in 2019.¹ The 2020 number is especially staggering considering the sharp decline in vehicle miles traveled at the beginning of the COVID-19 pandemic. Property and casualty insurers have been at the forefront of safety on America's roadways for decades and to see these numbers increase at this rate is tragic and alarming.

The development of Automated Driving Systems (ADS) may be the most consequential transportation issue of our time. New technology and novel service strategies promise faster and better mobility that will be less expensive and more envi-

¹US Department of Transportation National Highway Safety Administration <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813240>

ronmentally friendly. Spring boarding from existing and widely accepted “assisted driving” systems such as cruise control, ADS developers promise a wider array of functions, from greater driver assistance to vehicles that will perform every driving operation without human intervention.

SAFETY MUST BE THE PRIMARY AND OVERRIDING FOCUS

The single most important reason to support the development of ADS is the potential to enhance safety and save lives. While the idea of working, napping, or watching a movie while the car drives itself may be enticing to many, enhanced safety must always be the primary focus of ADS development. ADS that are proven safer than existing drivers will have innumerable benefits to society. However, the development and deployment of proven, safe ADS will require significant technological advances, revisions to the regulatory paradigm, and the active participation of all stakeholders. Innovation for the sake of innovation that is not demonstrably connected to enhanced safety merely serves as a convenient talking point.

Safety must be the primary goal for ADS development, but defining and proving what “improved safety” means for ADS is not simple. Currently, federal auto safety regulations focus more on the structure and design of vehicles and less on the driving operations that are subject to human control. With ADS, the vehicle will assume driving operations formerly performed by the human driver. Thus, the safety responsibilities of the vehicle will expand and will continue to expand until the vehicle assumes all driving operations without any human control and reduces the frequency of crashes caused by sleeping, intoxication, distraction, or speeding.

The potential for technology to move the proverbial needle on crash statistics is extraordinary. However, there will still be crashes, especially in an environment where automated vehicles continue to share the road with human drivers. It is important to note that ADS, in and of themselves, do not fundamentally change the legal theories of liability associated with motor vehicle crashes. As these ADS crashes happen and questions of liability arise, insurance will play a crucial role for ADS manufacturers, suppliers, owners, operators, and passengers.

According to the NHTSA, fully automated vehicles that can see more and act faster than human drivers could greatly reduce errors, the resulting crashes, and their toll. On the other hand, the elimination of certain human errors does not tell us anything about the introduction of computer, sensor, or software error. Safe ADS will require a substantial amount of specialized software, sensors, controllers, and actuators to collectively perform without error, or at least as well as those human drivers, the large universe of operations that human drivers already perform. The bar for performance has been set high: human drivers since 2017 have averaged approximately 500,000 vehicle miles between crashes, more than one million vehicle miles between crashes with an injury and nearly 100 million vehicle miles between fatal crashes.²

The development of ADS will require a new way to look at the fundamental nature of driving, and that development should not be hindered by requiring outdated safety requirements that do not apply to new technologies. At the extreme end of the spectrum, the development of ADS with no driver controls will mean that vehicle features that are now required for human operation may not be necessary or practical. Sound policy should include a review of which requirements would no longer be relevant for a fully autonomous vehicle.

The Federal Motor Vehicle Safety Standards (FMVSS) are the U.S. federal regulations specifying nationwide design, construction, performance, and durability requirements for auto-safety-related components, systems, and design features. FMVSS focus mostly on crash avoidance, crashworthiness, and crash survivability. Existing FMVSS specify that controls and displays must be located where they are visible to or within the reach of a person sitting in the driver’s seat. Depending on whether the occupants have “dual mode” or no control of an ADS, there may not be a “driver’s seat” or the relevant controls or displays of driving operations may vary with the driving operations that the human retains. In various iterations of ADS, auto parts subject to FMVSS, such as rearview mirrors, may or may not be superfluous for driving operations. Similarly, controls for turn signals, lights, or wipers may or may not be required and may or may not be subject to safety standards.

The focus must remain on ensuring that critical safety aspects are examined and validated, and that any safety assurance gaps that may be created by the introduction of ADS onto the roads are identified and addressed. This is far more com-

² US Department of Transportation Bureau of Transportation Statistics <https://www.bts.gov/content/motor-vehicle-safety-data>

plicated than it may seem. While many human-driver focused FMVSS do not make sense for ADS, perhaps ADS-specific safety tests should accompany broad exemptions. Existing self-certification should be supplemented by governmentally defined and publicly disclosed standards and then supplemented by third-party validation of design and testing. Pre-market approval has many downsides, but some level of independent ADS safety review could supplement self-certification.

DEFINING AND ANALYZING THE APPROPRIATE SAFETY DATA IS CRITICAL

Insurers should have access to a robust ADS information and data framework—including crash accident and incident information and data for businesses purposes, including underwriting and rating—that is timely, complete, and useful. It is critically important for Congress to address these issues when writing any legislation for the development and deployment of automated vehicles.

For a long time to come, vehicles equipped with ADS will share the road with vehicles with no automation and these vehicles will inevitably be involved in crashes. Furthermore, the increased removal of human driver error through automation introduces new risk factors that could cause crashes such as sensor, camera, and software errors. Because of this, determining liability following a crash will increasingly rely on the data that the vehicle generates prior to and during a crash. Making a liability determination and addressing claims will require a more complete understanding of what the vehicle was designed to do and not do, what the human driver was required to do and not do, and under what conditions, as well as the proper upkeep of the vehicle and all relevant traffic and weather conditions. Recent high-profile examples of fatal automobile crashes where it is in dispute whether the vehicle was in “autopilot” mode tragically highlight the need to ensure that incident and maintenance data is available to third parties, especially insurers.

The types of objective and verifiable data that will be required to provide insurance for ADS—data on crash frequency, crash severity, and repairs—are the same types of data that can authoritatively validate safety levels of ADS to the public and regulators. Auto insurance rates and coverage are established by insurance companies using vast amounts of historical data and established actuarial science, analyzing years of relevant data on frequency and severity of incidents. The rates determined by insurance companies are then frequently subject to a review by the state insurance regulators to ensure that they are fair and supported by data.

Valid and understandable data on ADS is critical to safety. The development and deployment of ADS—particularly the proposed ADS with no controls for a human driver—is a game changer. It will entail a fundamental change in transportation, mobility, infrastructure, and myriad other areas. The adoption of ADS on a wide scale will impact millions of people and will require adaptation by governments, industries, and the culture in general. The precondition to this development is an accepted belief that ADS improve safety, which will itself require sufficient data and information upon which to validate that belief. To date, information about ADS development in general and safety specifically has been limited.

ADS development is still in the early stages and numerous business, design, technical, and other issues are still only being discussed. In the competition to bring ADS to market, there should be a requisite level of confidentiality. Insurance companies understand confidential information and have a long history of working with auto companies to obtain and use available data responsibly. Similarly, insurance companies have deep experience in data security and the wide scope of data privacy requirements when it comes to both their own products and the protection of policyholder information.

It would be in the best interests of proponents of safe ADS to coordinate and consider new and improved alternative means to communicate on ADS technology and performance. Somewhere between the extreme poles of “just trust us” and reams of federal and state regulations requiring submission of millions of certified data points is a system of information and communication that is usable and comprehensible for the public, governments, and other industries. Validation of safe ADS development and subsequent public acceptance can be greatly enhanced by a measurable gauge of ADS safety/risks through recognized analysis of the most relevant data. Insurers, with their direct and ongoing contact with drivers and owners, are a most effective way to enhance that communication.

THE CHALLENGE: DEFINING WHAT DUAL CONTROL AUTOMATED/DRIVER VEHICLES CAN DO AND CANNOT DO

Today, and possibly for a long time to come, the full driving task—SAE Levels 4 and 5—is too complex an activity to be fully formalized as a sensing-acting robotics system that can be explicitly solved through model-based and learning-based ap-

proaches to achieve full unconstrained vehicle autonomy.³ Car companies—or original equipment manufacturers, as they are known—are building and offering cars today in which the dynamic driving tasks of the vehicle can be controlled at times by the vehicle and at times by the occupant. These conditional automation/dual-control cars can be as relatively simple as the widely used automatic braking. Advanced driving assistance features today specify that they do not substitute for the driver’s responsibility to operate the vehicle in a safe manner; that the driver should remain attentive to traffic, surroundings, and road conditions always; and that visibility, weather, and road conditions may affect feature performance.

It is important to understand the designed capabilities and limitations of the dual control vehicle and how and when driving operations were engaged or disengaged leading up to the crash. Robert Sumwalt, former Chair of the National Transportation Safety Board (NTSB) has stated, “As more manufacturers deploy driving automation systems on their vehicles, to improve system safety, it will be necessary to develop detailed information about how the active safety systems performed during, and how drivers responded to, a crash sequence. Manufacturers, regulators, and crash investigators all need specific data in the event of a system malfunction or crash.”⁴

One of the biggest impediments today is public wariness of automated vehicles, with public confidence in “self-driving” cars rated as low in recent studies.⁵ Providing more specific information about what each model is designed to do will enable consumers to better understand and accept their responsibilities in these vehicles. Increasing confidence in the technology through access to more and better information of the specific capabilities and limitations of a vehicle could enhance the safe operation and prepare consumers for higher levels of automation in the future. This same information can greatly assist the further development and implementation for clear federal and state regulations for the deployment of these vehicles. By making this information widely available without prescriptive government regulations, OEMs can provide regulators with the assurances they need but retain the flexibility to modify disclosures to address upgrades and revisions. False or misleading information will remain subject to existing civil and criminal sanctions.

INSURANCE COMPANIES HAVE THE EXPERTISE TO HELP ASSESSMENT OF THE SAFETY TESTING OF AUTOMATED VEHICLES

Insurers have long championed auto and highway safety issues and have helped raise public awareness through the creation and ongoing support of auto safety research organizations such as the Insurance Institute for Highway Safety and the Highway Loss Data Institute. The Insurance Institute for Highway Safety is an independent, nonprofit scientific and educational organization dedicated to reducing the losses—deaths, injuries, and property damage—from motor vehicle crashes. The Highway Loss Data Institute shares and supports this mission through scientific studies of insurance data representing the human and economic losses resulting from the ownership and operation of different types of vehicles and by publishing insurance loss results by vehicle make and model. Insurers have long allied with safety groups to work together to make America’s roads safer.

The critical issues related to passenger safety, liability, and recovery after a crash require that insurance companies are included in the development, deployment, regulation, and use of ADS, including any NHTSA research program. Consumers will continue to look to property/casualty insurers to embrace and support safety enhancements as this new frontier of automotive products and services evolves. A JD

³ Citing MIT Advanced Vehicle Technology Study: Large-Scale Naturalistic Driving Study of Driver Behavior and Interaction with Automation, available at <https://arxiv.org/pdf/1711.06976.pdf>.

⁴ Testimony of The Honorable Robert L. Sumwalt, III, chairman, National Transportation Safety Board, before the Committee on Commerce, Science, and Transportation, United States Senate hearing “Highly Automated Vehicles: Federal Perspectives on the Deployment of Safety Technology,” page 9 at <https://www.commerce.senate.gov/services/files/B8EF39B5-DE24-48AA-A870-B6CF8E0D5033>.

⁵ A survey sponsored by Partners for Automated Vehicle Education reported that nearly three in four Americans say AV technology is “not ready for primetime.” 48% of Americans said they “would never get in a taxi or ride-share vehicle that was being driven autonomously.” 58% think safe AVs will be available in ten years, and 20% believe they will never be safe. Only 34% of Americans thought “the advantages of AVs outweigh any potential disadvantages” and only 18% of Americans agree with the statement “if there was a website to get on a waiting list for the first AV, I’d put my name down.” <https://pavecampaign.org/pave-poll-americans-wary-of-avs-but-say-education-and-experience-with-technology-can-build-trust/>

Power survey found that consumers have the highest levels of confidence in insurance companies when it comes to dealing with ADS.⁶

The business of insurance demands the application of hard data and actuarial science to assess and mitigate risk. It was more than 30 years ago that coalitions of insurance companies together with consumer groups first favored state requirements for seat belts and air bags and opposed the auto makers' reluctance to provide such safety features.

Insurers have a long and proven history of working together with regulators at all levels of government, and auto manufacturers, to facilitate developments that save lives and prevent injuries and damage. The revolutionary replacement of the human driver with ADS will require auto insurers to understand each vehicle's design and operation. Ultimately, drivers may not be comfortable with "dual mode" or no control whatsoever, which means that the insurer of that human driver must fully understand the planned automated driving operations as well as any possible human operation of the vehicle under any circumstances.

The insurance industry understands that new and different data will be needed for insurers to write ADS-related insurance policies. The extensive history and level of human driving data that insurers have developed must now be supplemented by increasingly complex data on the automated driving systems that assist or replace those human drivers. Insurers have a proven record of assessing driving risks and communicating to auto owners the methods to mitigate that risk.

CONCLUSION

The insurance industry has continuously proven its commitment to supporting the development and deployment of real auto safety benefits at the earliest time. For ADS, these benefits are dependent, however, on many daunting technological, logistical, and regulatory revisions that remain to be designed and successfully implemented. The existing environment of auto safety regulation evolved with a human-driver focus and has not fully considered the many nuances of increased assisted and automated driving systems. As these systems develop and evolve, the risk of regulatory safety gaps increases and the need for a comprehensive reassessment of driving operation safety grows exponentially, starting with the paramount focus on the safety of vehicle occupants, occupants of other vehicles, and the public.

For the public to understand and accept ADS safety developments⁷, we must show how we got to the answer; to illustrate the exact steps taken to achieve specific metrics of safety for ADS. Broad assurances of overall safety must be bolstered by facts and data on ADS design and operation. Third party validation of ADS data and safety testing by insurers will help to develop the requisite public, insurer, and governmental trust to support further ADS deployment.

A prerequisite of that trust, particularly for insurers, is the access to more, better, and timely data on the proposed and adopted design and operation of ADS, as well as a framework for the access and analysis of accident information for purposes of establishing liability. Through their highly regulated development of rates and coverage, insurers apply many of the objective and independent validations sought for ADS operational safety. Just as with the established and active advocacy of seat belts and air bags, auto insurance companies are committed to working with auto manufacturers and safety advocates to develop and implement commercial standards that can save lives.

As an industry that has extensive experience with automobile technology and safety, we look forward to working with the subcommittee on this important issue. Thank you for your consideration and we would welcome the opportunity to discuss further.

Sincerely,

TOM KAROL,

General Counsel Federal, National Association of Mutual Insurance Companies.

⁶Automated Vehicles and Insurance Pulse Survey, https://www.namic.org/pdf/18memberadvisory/181008_Automated_Vehicles_JD_Power_NAMIC_Questionnaire.pdf

⁷A 2019 Reuters/Ipsos poll found that half of U.S. adults think automated vehicles are more dangerous than traditional vehicles operated by people, and more than 60 percent of respondents would not pay more to have a self-driving feature on their vehicle. Americans still don't trust self-driving cars, Reuters/Ipsos poll finds, at <https://www.reuters.com/article/us-autos-selfdriving-poll/americans-still-dont-trust-self-driving-cars-reuters-ipsos-poll-finds-idUSKCN1RD2QS> AAA reported that more than 70 percent of Americans are afraid to ride in a self-driving car, an increase from 63 percent in 2017. Three in Four Americans Remain Afraid of Fully Self-Driving Vehicles, at <https://newsroom.aaa.com/2019/03/americans-fear-self-driving-cars-survey/>

Mr. RODNEY DAVIS OF ILLINOIS. Thank you. And we will email it too, follow those instructions.

I want to welcome everyone to today's hearing, along with Chair Norton, on automated vehicles.

AVs offer the opportunity to not only transform the automotive, trucking, and transit industries, but they will also transform our Nation as a whole, and solve many of the challenges that we face.

As you know, this subcommittee has jurisdiction over large trucks and buses. Employing automated technologies on trucks and buses will have economic and societal implications that we believe will benefit every American.

Most importantly, incorporating this new technology will save lives. The National Highway Traffic Safety Administration estimates that 38,680 people died in motor vehicle accidents in 2020 and expects fatalities to increase in 2021. According to the Department of Transportation, 94 percent of serious crashes are due to driver error. Because AVs are expected to anticipate dangers and mitigate or remove human error from the chain of events that lead to a crash, AV technology would increase safety and save lives.

In addition, AVs could revolutionize mobility and make the transport of goods and people safer, easier, cheaper, more efficient, and more accessible. AV technology could improve mobility for vulnerable groups, including the elderly and those with disabilities, connecting them with jobs and services and allowing them to live independently. In addition, the resulting freight transportation efficiencies could reduce the cost of goods for consumers, and in the longer term, provide solutions to some of the supply chain bottlenecks that America is currently experiencing today.

While these benefits are compelling, we must recognize the potential impacts of AV technology and what they could have on our workforce, and we need to implement pro-worker policies. Because AV deployment may lead to fewer professional driving jobs, we need to incorporate employee development and training programs to upskill our workforce so that they can take advantage of new jobs that AVs will create.

Today, transit agencies and trucking companies are partnering with technology firms to test AVs. Our future depends on what we do now. We need to have a clear regulatory structure in place to be able to continue to support AV innovations and its eventual deployment. We need to take the steps necessary to ensure that America cements its leadership in the AV space.

And with that, I want to thank our witnesses for joining us today, and I look forward to hearing their testimony.

[Mr. Davis's prepared statement follows:]

Prepared Statement of Hon. Rodney Davis, a Representative in Congress from the State of Illinois, and Ranking Member, Subcommittee on Highways and Transit

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With that, I want to thank our witnesses for joining us today, and I look forward to hearing their testimony.

Mr. RODNEY DAVIS OF ILLINOIS. And I yield back.

Ms. NORTON. Thank you, Mr. Davis. I am now pleased to yield to the chair of the full committee, Mr. DeFazio, for any opening statement he may have.

Mr. DEFAZIO. Thank you, Madam Chair. Thanks for holding this very important hearing, and thanks to all the witnesses. Since there are so many witnesses, and there is a lot to learn, I will be very brief.

But the challenges that are proposed—obviously, there is tremendous promise with AVs; already a number of aspects of those promises have been mentioned by the two preceding speakers. I won't repeat those.

But it is also a tremendous challenge to regulators to regulate a rapidly evolving technology. To be certain that all public interests are included in the development, deployment, and operation of these vehicles is going to be an extraordinary challenge for the Federal regulators. It shouldn't be done State by State. We need some reasonable guidelines, federally, and we have got to get it right.

You know, unregulated—we saw what happened with Boeing and the MAX, and we don't want that to happen with AVs. I just read a report today, and I think it was the Washington Post, that there were 34 unexpected and unnecessary severe braking incidents in Teslas last month. It didn't lead to any major accidents yet, but it certainly could. So, there are potential downsides to this technology, as it is being deployed and developed, and we have to stay on top of that.

It also presents a challenge to our infrastructure that these AVs use different ways of, basically, centering themselves on the road. If you don't have good striping, if you don't have fog lines, and if you don't have regular signage, it is going to be much more problematic of deployment and rollout, ultimately.

So, we have got to get it right. We have got to realize the promise. We can mitigate congestion, certainly mitigate deaths, and be a more efficient Nation in terms of fuel consumption. There is a whole host of benefits just waiting out there. We've just got to get it right as we move toward them.

[Mr. DeFazio's prepared statement follows:]

Prepared Statement of Hon. Peter A. DeFazio, a Representative in Congress from the State of Oregon, and Chair, Committee on Transportation and Infrastructure

Thank you, Madam Chair, for holding this important hearing on automated vehicles.

To some, AVs are a new, far-fetched technology. To a degree, this is true. But in more and more cases, AVs are already here. A company called TuSimple reported that they just completed the first automated truck run on public roads without a human in the vehicle and without human intervention. Waymo has been operating a robotaxi service in Phoenix since October 2020. According to DOT, there are over 1,400 automated vehicles currently in testing by more than 80 companies across 36 states. I had the privilege to ride in an automated Waymo vehicle in California a few years ago.

AVs have the potential to bring significant benefits to the traveling public and reduce deaths on our roadways.

In 2019, an astounding 36,096 people were killed in motor vehicle traffic crashes on U.S. roadways. And traffic deaths have risen even higher during the pandemic. According to the National Highway Traffic Safety Administration (NHTSA), 20,160 people died in traffic crashes during the first half of 2021—that's the highest number of fatalities in that time period since 2006. Bicyclist and pedestrian deaths have increased by 50 percent since 2009. So not only are our roads dangerous, but they are getting worse for our most vulnerable road users.

In order to reap the safety benefits of AVs, regulators must do their part to hold industry accountable in this process and ensure that AVs deliver on their promise of safer roads. We know what can happen when regulators let industry go unchecked. The 737 MAX tragedy was the result of Boeing's corporate greed and a lax safety culture within the FAA.

We cannot make the same mistakes with automated vehicles. Safety—for all road users—should be our number one priority. We cannot cut corners in the name of expediency or convenience.

The deployment of AVs also stands to have tremendous impacts on the surface transportation workforce. As we begin to craft AV policy, labor must have a seat at the table to ensure that transportation workers can do their jobs safely, particularly as truck drivers and transit operators share the road with AVs.

As regulators work to hold automated trucks and buses to the highest safety standards, they must rely on the expertise of the men and women who operate these vehicles today. Professional commercial drivers have a deep well of knowledge on operating conditions on our roads, and must be part of the safe transition to advanced technologies.

The workforce implications to commercial drivers is another reason Congress should give special consideration to commercial AV policy, separate from ongoing work on passenger AVs.

I have fought for years to enact policy changes that make the job of a commercial truck driver safer and more sustainable. As automated commercial truck and bus deployment becomes closer to reality, Congress needs to consider policies to support these hard-working men and women and ensure that trucking remains a good career option.

Too often, American workers have been left behind when technologies evolve and corporate interests are left in charge of the way forward. Regulators and innovators need to work together to make safe automated vehicles and a stable, well-paid transportation workforce a reality in the future.

I thank each of the witnesses assembled here today, and I look forward to this important discussion.

Mr. DEFAZIO. Thank you, Madam Chair.

Ms. NORTON. Thank you, Chairman DeFazio. I would like to now welcome today's witnesses on our panel: The Honorable Martha Castex-Tatum, vice mayor pro tem and city councilmember for Houston, Texas, testifying on behalf of the National League of Cities; Mr. Scott Marler, director, Iowa Department of Transportation, testifying on behalf of the American Association of State Highway and Transportation Officials; Mr. John Samuelsen, international president, Transport Workers Union of America; Ms. Catherine Chase, president, Advocates for Highway and Auto Safety; Mr. Nat Beuse, vice president of safety, Aurora; Mr. Doug Bloch, political director, Teamsters Joint Council 7; Mr. Nico Larco, director and professor of Urbanism Next Center, University of Oregon; and Mr. Ariel Wolf, general counsel, Autonomous Vehicle Industry Association.

Thank you for being here today, I look forward to your testimony.

Without objection, our witnesses' full statements will be included in the record.

Since your testimony has been made a part of the record, the subcommittee requests that you limit your oral testimony to 5 minutes.

First, Ms. Castex-Tatum, you may proceed.

TESTIMONY OF HON. MARTHA CASTEX-TATUM, VICE MAYOR PRO TEMPORE, HOUSTON, TX, AND COUNCILMEMBER, DISTRICT K, HOUSTON, TX, ON BEHALF OF THE NATIONAL LEAGUE OF CITIES; SCOTT MARLER, DIRECTOR, IOWA DEPARTMENT OF TRANSPORTATION, ON BEHALF OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS; JOHN SAMUELSEN, INTERNATIONAL PRESIDENT, TRANSPORT WORKERS UNION OF AMERICA, AFL-CIO; CATHERINE CHASE, PRESIDENT, ADVOCATES FOR HIGHWAY AND AUTO SAFETY; NAT BEUSE, VICE PRESIDENT OF SAFETY, AURORA; DOUG BLOCH, POLITICAL DIRECTOR, JOINT COUNCIL 7, INTERNATIONAL BROTHERHOOD OF TEAMSTERS; NICO LARCO, AIA, DIRECTOR AND PROFESSOR, URBANISM NEXT CENTER, UNIVERSITY OF OREGON; AND ARIEL WOLF, ESQ., GENERAL COUNSEL, AUTONOMOUS VEHICLE INDUSTRY ASSOCIATION

Ms. CASTEX-TATUM. Good morning, Chair Norton, Chair DeFazio, Ranking Member Graves, Ranking Member Davis, and members of the subcommittee. I am Houston's vice mayor pro tem, representing District K, on the southwest side of Houston. I am here today on behalf of the National League of Cities to discuss our experiences with piloting autonomous vehicles.

Zero is the only acceptable number of deaths on America's roads. Today we are losing far too many of our residents to dangerous roads in Houston and across this country, and efforts to reduce fatalities must include every possible strategy, including autonomous vehicles.

Cities handle most aspects of public transportation, and that experience and authority equips us to see both the opportunities and challenges to these new types of transportation. We are aiming to create the right environment of shared, safe, connected AV trans-

portation options that will better serve our residents and meet our goals as a city.

In Houston, piloting the testing of AV started with our METRO transit agency and their self-driving shuttle at Texas Southern University on their Tiger Walk across campus. They are now expanding their pilots to on-road options between two universities, AV buses, and researching better paratransit options.

My district was one of the first three areas in Houston where Nuro launched zero-occupant AVs for commercial service delivery using lower speeds and smaller, lightweight vehicles. These AVs pull right up to your home and deliver groceries, prescriptions, or hot food from Kroger, Domino's, CVS, and the Houston Food Bank, which has been extremely helpful during COVID, when we needed to social distance, but also needed our daily necessities.

When Nuro first came to District K, we made arrangements with our local police officers to allow them to see the vehicle, understand how to access it in an emergency, and to ask questions. As with all AVs, these vehicles must be designed to operate on the roads, as they exist today, and to interact in the real-world situations.

Today the National League of Cities is providing three recommendations for Federal action.

Number one, invest in piloting with local governments. Congress and the U.S. Department of Transportation can support a Federal pilot for local AV testing, in partnership with communities, and with strong safety guidelines. The scaling and spread of piloting to different areas of the country and different climates can encourage the data exchange that will allow for Federal safety regulators to move the entire autonomous industry forward.

Number two, invest in ensuring a skilled, trained workforce. In Houston, we want to ensure residents have access to quality jobs that have even higher earning potential. We are encouraged by companies like Nuro starting new upskilling training programs with community colleges. But investments in our Nation's workforce need to happen at scale. We know we need workers for infrastructure rebuilding and for growing technology industries like AVs. If we do not invest in worker training now, NLC's latest study shows the U.S. will struggle to fill at least 4.5 million jobs. Any moving legislation, like the Build Back Better Act, must invest in workforce training.

Number three, raise planning and technology sharing in regions. Anticipating, adapting, and accommodating for changes is the basis for good transportation planning. New technology is changing transportation, and investment and planning for the future will serve us in more sustainable and practical ways.

In closing, we firmly believe Congress and America's cities, towns, and villages are crucial to the safe adoption of AVs into our existing transportation networks. I am proud of the work that we have done in Houston, and we look forward to working with each of you as we advance our shared goals in transportation safely together.

Thank you.

[Ms. Castex-Tatum's prepared statement follows:]

Prepared Statement of Hon. Martha Castex-Tatum, Vice Mayor Pro Tempore, Houston, TX, and Councilmember, District K, Houston, TX, on behalf of the National League of Cities

Good morning, Chair Norton, Chair DeFazio, Ranking Members Graves and Davis, and Members of the Subcommittee:

I am Vice Mayor Pro Tempore Martha Castex-Tatum from Houston, Texas, and the council member of District K, a growing area on the southwest side of Houston. There is a unique level of responsibility when you are the council member representing your mom and dad, your ninth-grade science teacher, eighth grade basketball coach, and so many others in the community where you were raised. I am honored to serve and impact city government which in turn impacts the quality of life of our shared constituencies. Houston must be a safe and thriving city for them to live, work and play.

I am here today on behalf of the National League of Cities (NLC)—the nation’s oldest and largest network of cities, towns and villages across America. I would like to share with you our city’s experience with piloting autonomous vehicles (AVs) and to share the collective wisdom of our city leaders who are both leading the way for AV testing programs and calling for safer streets, sidewalks, and vehicles. Today we are losing far too many of our residents to dangerous roads, driving, and vehicles.

Last week, NLC applauded the USDOT releasing their National Roadway Safety Strategy, a roadmap for addressing the national crisis in roadway fatalities and serious injuries, and we thank Congress for including a new local *Safer Streets and Roads for All* program in the Bipartisan Infrastructure Law. We must change the current transportation status quo which is no longer serving us well. Houston has set the goal of zero fatalities on our roads. We have lost over 200 lives on Houston’s roads plus more than 1,000 serious injuries every year since 2014. Zero is the only acceptable number of deaths on America’s roads. We want you to know that city leaders are committed to eliminating these fatalities and serious injuries by 2030, through our city efforts like Houston’s Vision Zero program as well as our collective efforts at the NLC like the “Safety First Challenge for Safer Streets” and through participation in the Road to Zero coalition. We look forward to being able to access the safety funds and other programs in the bipartisan infrastructure law new programs once Congress has passed their annual budget which is overdue. Some of the benefits of the bipartisan infrastructure law are being unnecessarily delayed due to Congress’ failure to pass the fiscal year 2022 appropriations legislation—this includes programs like the new competitive bridge program even while we saw the horrific photos of a bridge failure last week. At the local level, we are willing to make every effort to reduce fatalities using every possible strategy, including AVs, but we need Congress to complete their fundamental duties here in Washington so we can move the benefits of the bipartisan infrastructure bill forward.

Cities are proud of our reputation as leaders in transportation and innovation. We know we are the ideal laboratories where new mobility models are gravitating to pilot today as many more companies move from test tracks to real streets. From transportation network companies, to bus rapid transit, to micromobility, to shared cars and AV shuttles and buses, the transportation of the future is shared and connected—and it is here today.

Solutions like shared AV rides are important because we cannot just replace a regular gasoline car with an autonomous one. Congestion today demands that we leverage as many shared and connected options as possible. Cities are aiming to create the right environment of shared, safe, connected, and autonomous transportation options that will better serve our residents and meet our goals. While these are significant ambitions, local governments orchestrate most aspects of public transportation in their areas, and our experience and authority equips us to understand both the opportunities and challenges of new entrants to city streets including AVs which we’re here to focus on today.

HOUSTON’S AV PILOTS

Piloting and testing of AVs is happening today on our streets in Houston, across Texas, and in many other states where they are actively passing legislation. As our industry is being shaped, Congress remains a critical leader to:

- 1) ensure safe operations,
- 2) prepare our workforce for the great jobs ahead, and
- 3) invest in foundational transportation planning and technology that will serve us in more sustainable and practical ways.

AUTONOMOUS TRANSIT PILOT

Houston METRO, our transit agency, was the first entity in our city to start piloting a self-driving shuttle at Texas Southern University in 2019. It operated on *Tiger Walk* and served students moving around campus. The Operational Plan laid out some of the infrastructure preparations made to ensure a safe pilot for a new technology, including:

- An emergency operator was on board;
- Emergency procedures were created with TSU's Department of Safety;
- Post-Accident Testing Decision Maker and Notification Testing Form was developed;
- Signage for pedestrians (not for AVs to read) was implemented on the Walk;
- Guests and METRO personnel were required to complete a consent form before boarding the shuttle; and
- Surveys were conducted at the end of rides.

While the METRO EasyMile shuttle pilot has ended, METRO is starting Phase II to provide first and last mile service between Texas Southern University and the University of Houston in 2022–2024. This “Shuttle of the Future” will be an electric shuttle with Level 4 autonomous self-driving and leverage the Federal Transit Administration's Accelerating Innovative Mobility Grant as an Autonomous Vehicle Proving Ground. METRO will continue its involvement in the Automated Bus Consortium, a national collection of transit agencies and departments of transportation to facilitate development of a full-size electric automated bus. Transit continues to be where so much of the value of automation can be realized.

AUTONOMOUS ZERO-OCCUPANT DELIVERY

Houston is also one of the first cities to see AVs conducting commercial delivery service, with the deployment of Nuro's zero-occupant, electric AVs, and I am glad that my own District K was one of the first three zip codes where service launched. These vehicles are offering our residents more zero-emission options with lower speeds and smaller, lightweight vehicles. Since 2019, Nuro has delivered groceries, prescriptions, and hot food in partnership with Kroger's, Domino's, CVS, and the Houston Food Bank, which has been helpful during a time when we needed to social distance but also required necessities such as groceries and medicine. They also just completed a year-long research pilot with Houston METRO, exploring the benefits of autonomous delivery service for paratransit customers.

When Nuro first came to District K, we made arrangements with our local police officers to allow them to see the vehicle, understand how to access it in an emergency, and ask questions. Nuro's Law Enforcement Interaction Plan provides the procedures, instructions, and vehicle information necessary to support first responders in the event of an emergency or other issue. They also validated the technical capabilities of their software through perception testing with the Houston Police Department to ensure their AVs detect and respond to emergency vehicles. Prior to testing, and throughout deployment, we saw outreach to our local communities and regular engagement with first responders and city staff to ensure Nuro's vehicles are safely moving into our neighborhoods.

As a mother raising an infant, the promise of an autonomous vehicle delivery dropping off necessities would have been a welcome option from having to pack a diaper bag, then a child into a car seat and go through the motions of parking, unloading, sanitizing the cart, check out, reloading, arriving, unloading my child and the bags, and finally getting settled in, back at home. The time saved, anxiety and elimination of a potential incident on the road are clear reasons to see these opportunities and change it for the better. Sometimes we do not realize the hurdles we create because of the inherited design and land use previous generations made that impact our daily lives.

AV INFRASTRUCTURE NEEDS

As autonomous vehicle companies have said before in front of Congress, these vehicles are designed to operate on the roads as they exist today. While most have to extensively map, learn, and grow their testing areas, AVs do not require any new infrastructure improvements specific to autonomous vehicles. However, they do benefit from roads in good shape like any car or driver. If we had to redesign the roads or chip every asset as some suggested to allow AVs on our roads, the cost for local governments who own and maintain the majority of the nation's roads, streets and sidewalks would be untenable. Design of our roads is a critical issue for cities like Houston, and we welcome the opportunity to work with Congress to ensure that guides, like the Manual on Uniform Traffic Control Devices, evolve into the modern

and technology-forward tools we need that reflect the budgets we must be realistic about.

The nation's city leaders see that AV technology is here so it cannot be ignored or left in a regulatory limbo while it operates on our streets. In my role as a Councilmember, my job is to ensure that if the technology is here, then we must prepare to use it well and be willing to speak up when challenges exceed our local reach. Today, NLC is providing three recommendations for federal action that will promote safe AV testing if done correctly and also grow job opportunities in the U.S. as well as urge you to pass the fiscal year 2022 appropriations legislation so the America's infrastructure work is not further delayed.

1. *Invest in Piloting With Local Governments*

America's cities are open to piloting more technology safely that can make our residents' lives better, and Congress and the U.S. Department of Transportation can support localized piloting in a new effort with strong federal safety guidelines. We need to move forward on piloting this technology, particularly for shared uses and in areas of the country that feel left behind, and USDOT has the authority to act on this today. While large hub cities naturally have technology partners interested in testing, thousands more cities and rural towns are interested in what an AV shuttle, like METRO's, or even just one delivery AV, like Nuro, could mean for their community. NLC believes that we can see clearly from our current landscape that simply allowing exemptions and opening up wide areas for testing alone is not going to meet the transportation needs of our country especially in rural and suburban communities. The intentional scaling and spread of piloting to different areas and climates, data exchange, and transportation planning can fundamentally impact our transportation rides as a country and allow for federal safety regulators to have the necessary data to move the whole autonomous industry forward out of its current limbo and exemptions process. A national pilot under USDOT's careful safety watch could also:

- ensure the type of local safety preparations that we used in Houston are followed as standard practices;
- support clear standardization of necessary connectivity infrastructure;
- ensure cybersecurity practices;
- share operations data that planners need to assess operations in context and NHTSA needs in order to adapt car safety standards to AVs;
- support shared ride practices with equity in mind in urban, suburban and rural markets as well as places with snow and climate challenges; and
- bring piloting forward without setting safety aside.

2. *Invest in Ensuring a Skilled, Trained Workforce*

Investment in workforce needs to happen at scale and today. In cities, towns, and villages across America, we know that we cannot carry out today's road, bridge, water and broadband projects funded through the bipartisan infrastructure law without trained, skilled workers—to say nothing of the future demand for new skills sparked by new technologies such as autonomous vehicles.

In Houston, we want to ensure that we are building up high quality jobs that have even higher earning potential. Locally in Houston, to fill the jobs of the near future at Nuro requires a new focus on upscaling our technical training. Nuro employs 120 people in Houston and continues to actively hire more. These are full-time jobs with full benefits across skill levels ranging from high school graduates to PhDs. There are several dire and rosy estimates on the impact of AV jobs, but we must consider the quality of jobs in the discussion and recognize that a delivery job may not pay the rent, but a technician position might. That job leap is made possible with workforce training.

In 2021, Nuro launched a first-of-its-kind National Upskilling Initiative that establishes partnerships with community colleges in their operating areas to create education and training opportunities for workers looking to transition to jobs working on autonomous, electric vehicles. Nuro is working with San Jacinto College to establish a certificate program for a variety of roles, many of which do not require four-year degrees, including Fleet Technicians, Junior Fleet Technicians, and Fleet Technician Supervisors. Students qualify for paid internships or part-time work opportunities at Nuro while completing the pathway. They also have preference in applying to full-time positions at the company after completing the initial coursework. New programs will build on learnings from Nuro's current partnership with De Anza College in California, which also includes a tuition-free option.

We also know municipal governments and transit agencies like METRO are equally in need of the right skills to work on more electric and computer-driven vehicles. *How Hard-to-Fill Infrastructure Jobs Impact Building Our Future*, a recent

report on infrastructure jobs by the National League of Cities, found that the median infrastructure job takes 20% more time to fill than a non-infrastructure job. To put that in perspective, *if we do nothing to improve labor market outcomes for infrastructure-related jobs, we can anticipate that we will struggle to fill at least 4.5 million jobs nationally*, which would close the door to opportunity and economic well-being for too many families, businesses and communities.

To meet our own workforce needs, Houston has focused on STEM careers, particularly for youth. The City's Hire Houston Youth program has helped connect more than 30,000 Houston youth to careers, including those in new technologies. In addition, to ensure well-paying infrastructure job opportunities extend to all, we have established Houston's first reengagement center, so that Opportunity Youth ages 16 to 24 can finish school and progress into training. We are glad to be working with NLC and other leading cities on increasing tech-driven workforce opportunities for youth.

Even with our investments as a city, the worker gaps are widely seen and acknowledged by businesses and workers alike as a problem. As Congress moves forward with consideration of the Build Back Better Act, ensuring that we act quickly on workforce funding is paramount to making the most of our federal investment in infrastructure as well as bringing new workers into key sectors to meet employer demand. Without this investment, projects will take longer, cost more and slow our ability to meet employer needs.

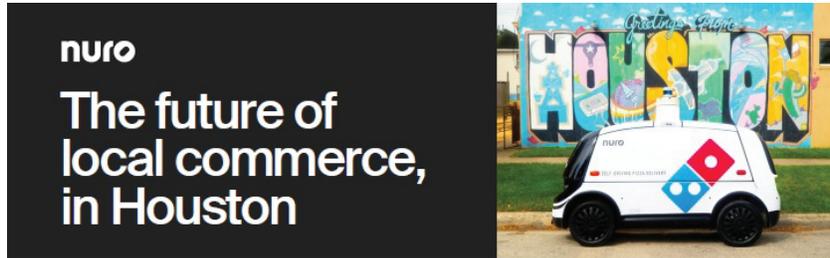
3. *Raise Planning and Technology Sharing in Regions*

America's transportation foundations shifted underneath our feet during COVID—including travel patterns, land use, freight movement, and more. While some changes are temporary like a pandemic travel reduction, the shifts from technology in transportation such as transportation network companies changes long-term dynamics. Additionally, larger external business trends like e-commerce remain steadily growing. Anticipating, adapting, and accommodating transportation for these trends is the basis of good transportation planning from our metropolitan planning organizations remains underappreciated in federal programming. Investing in foundational transportation planning, logistics, and technology at the metropolitan and regional levels will serve us in more sustainable and practical ways. Whether it was the arrival of scooters or the coming take-off of advanced aviation, the planning of America's transportation is an investment in the future.

SAFE AV TESTING TAKES ALL LEVELS OF GOVERNMENT

In conclusion, we firmly believe local governments are crucial to the safe adoption of AVs into our existing transportation networks with other transportation modes and users. Ultimately, implementation of a successful AV policy requires finding the appropriate balance between cooperating and delineating the respective state, local and federal responsibilities and ensuring that appropriate funding and incentives are in place for the desired outcomes. We must approach these issues in a systematic and pragmatic manner to ensure that safety on our nation's roadways and streets is paramount. America's cities, towns and villages look forward to working with each of you to advance our shared goals in transportation.

Thank you.



First autonomous commercial delivery service in Houston

About Nuro's Vehicles

- Autonomous Vehicle with no human occupants
- Designed to carry goods for delivery within cities
- Engineered to prioritize the safety of pedestrians, bicyclists, and other road users
- Fully electric and zero emissions

Our Service in Houston

Nuro's autonomous vehicles bring affordable, convenient delivery to Houston in partnership with popular stores and services. That means fewer trips to the store, safer neighborhoods, and more time to do what you choose. Nuro began delivering in West Houston in 2018, and currently employs over 120 local residents in our Gulfton and Heights locations.

Engaging with the Community

Working with the community to identify how Nuro's vehicles and delivery service can benefit our neighbors is key to our shared success. Before operating in cities, we reach out to municipalities, neighborhood groups, community organizations, and local leaders. We also train first responders on how to interact with our vehicles using our [Law Enforcement Interaction Protocol](#) and solicit feedback we can incorporate into our operations and technology.

How Customers Used Nuro to Get Domino's Pizza

- 

Order from Domino's
Place a delivery order on the Domino's app, and opt-in to autonomous delivery.
- 

We'll keep you updated.
Once Nuro's vehicle picks up your order and is on the way, we'll text you a link to easily keep track of its progress.
- 

Grab your order.
We'll text you an access code to retrieve your delivery at your curb. Your order will be secured separately from other items the vehicle is carrying.

Nuro has completed deliveries in partnership with leading brands and organizations in Houston



Mr. DEFAZIO [presiding]. Thank you.
 And now we would move to Mr. Scott Marler, director, Iowa Department of Transportation.
 Mr. Marler, you are recognized for 5 minutes.
 Mr. MARLER. Chair Norton, Chair DeFazio, Ranking Member Davis, Ranking Member Graves, and members of the subcommittee, good morning, and thank you for the opportunity to appear today and speak to the important topic of automated transportation. It is my honor to testify on behalf of the American Association of State Highway and Transportation Officials and the Iowa Department of Transportation.
 My main message is to share the critical importance that connected and automated vehicles, or CAVs, will have on improving

the safety, equity, and sustainability of the Nation's transportation system. State DOTs are preparing for a future with CAVs, and are absolutely dedicated to supporting the safe deployment of a connected, automated, and cooperative vehicle roadway ecosystem, where benefits extend across modes and throughout all States.

One of the key reasons State DOTs are so interested in CAVs is to improve roadway safety. We have learned that the first 9 months of 2021 were deadly on our Nation's roads, where more than 31,700 people died in traffic crashes. In Iowa alone, we lost 354 people to traffic crashes last year. This is entirely unacceptable, as each life lost is one too many.

USDOT recently announced the National Roadway Safety Strategy, which includes actions for safer roads and safer vehicles. CAVs hold tremendous potential to reduce crashes and save lives, and I believe that CAV technologies must be an integral part of these strategies in order to fully realize the safety promise they hold.

In Iowa, our vision for deploying automated transportation has taken a two-pronged approach, focused on the drivers of today and the CAVs of tomorrow. We have several strategies that promote readiness for a more connected and automated transportation future, including the following: defining our vision and plan, extensive stakeholder engagement through our Automated Transportation Council, new policies and legislation that now enable and support driverless vehicles, and infrastructure improvements that work for human drivers today and the CAVs of tomorrow.

Iowa's experience is not unique among the State DOTs. In October 2021, AASHTO adopted 10 CAV policy principles we believe are fundamental to the safe and effective deployment of CAVs across our States and Nation. I would like to quickly highlight two for you now.

First, to fully realize the benefits of automated transportation, AASHTO member States believe that vehicles must be more than automated; they must also be connected. Connected vehicle technology is key to ensuring automated vehicles have the enhanced safety features in place to fully advance our goals of a safe, mobile, equitable, and efficient transportation system. This is a key reason why we continue to strongly support the preservation of the 5.9 gigahertz spectrum.

Second, AASHTO believes there is an urgent need for a coordinated national strategy, which includes a vision and roadmap for CAV readiness and deployment. The vision and strategy must be developed collaboratively, with active input from infrastructure owner-operators, industry, communities, and all levels of Government. Because the safety and mobility benefits are potentially enormous, fully realizing them requires clear strategic direction to focus and align our programs and tactics.

These are only two of our CAV policy principles at AASHTO, and I encourage you to review all 10 in more detail.

I would like to conclude my remarks this morning by bringing emphasis to three critical actions that we believe will lead to the successful deployment of CAV technologies.

Number one, develop a national strategy and vision. Congress can foster progress by calling on USDOT and the transportation

community at large to articulate a clear vision and national strategy for automated transportation.

Number two, continue to foster collaboration and partnerships. USDOT needs to continue fostering partnerships and cross-sector dialogue, because collaboration is our competitive advantage.

Number three, preserve the needed communication spectrum. Congress can provide much-needed certainty by working within their authority to reserve the safety spectrum for transportation.

Thank you again for the honor and opportunity to testify today on behalf of AASHTO and the Iowa DOT. I will be happy to answer any followup questions. Thank you.

[Mr. Marler's prepared statement follows:]

Prepared Statement of Scott Marler, Director, Iowa Department of Transportation, on behalf of the American Association of State Highway and Transportation Officials

INTRODUCTION

Chair Norton, Ranking Member Davis, and Members of the Subcommittee, thank you for the opportunity to appear today and speak to the important topic of automated transportation and what lies ahead with these critical technologies.

My name is Scott Marler, and I serve as the Director of the Iowa Department of Transportation, chair of the AASHTO Committee on Transportation System Operations, and tri-chair of the Cooperative Automated Transportation (CAT) Coalition, a partnership between the American Association of State Highway and Transportation Officials (AASHTO), Intelligent Transportation Society of America (ITS America), Institute of Transportation Engineers (ITE), and the Federal Highway Administration (FHWA). Today, it is my honor to testify on behalf of the State of Iowa and AASHTO, which represents the state departments of transportation (DOTs) of all 50 states, Washington, DC, and Puerto Rico.

I firmly believe, as do the other state DOTs, that the deployment of connected and automated vehicles (CAVs) will greatly improve the safety, equity, and sustainability of the nation's transportation system. CAVs represent an important part of a multimodal transportation ecosystem, which we broadly refer to as cooperative automated transportation, with a focus on integrating connected and automated vehicle technologies for all existing and emerging modes of surface transportation. AASHTO considers the best safety and mobility benefits are achieved when automated vehicles are integrated with key transportation infrastructure assets that state DOTs own and operate.

Iowa, like all state DOTs, are infrastructure owners and operators (IOOs)¹ that play a fundamental role in advancing, operating, and maintaining the physical and digital infrastructure necessary to support intelligent transportation systems. The state DOTs have been focused on preparing for a more automated future, a term we call 'readiness', by focusing on interoperable, reliable, and consistent infrastructure (both physical and digital), a cohesive vision, collaborative partnerships, funding, and clear policy.

One of the key reasons state DOTs are so interested in CAVs is because of safety. An estimated 38,680 people died in motor vehicle crashes in 2020. In the first half of 2021, an estimated 20,160 people died, up 18.4 percent compared to the first six months of 2020². This is entirely unacceptable, as each life lost is one too many. The National Highway Traffic Safety Administration (NHTSA) estimates that safety applications enabled by CAV technologies could eliminate or mitigate the severity of up to 80 percent of non-impaired crashes, including crashes at intersections or

¹Infrastructure Owners and Operators (IOO) are defined as the entity responsible for day-to-day operation and maintenance of the transportation assets and the long-term planning and investment required to manage the transportation system.

²U.S. Department of Transportation. *National Roadway Safety Strategy*. January 2022. Available at <https://www.transportation.gov/NRSS>. Accessed January 28, 2022.

while changing lanes³. Iowa DOT and every other transportation departments at the state and local levels are committed to improving the safety of the transportation system, with CAV technologies being another vital tool in our toolbox. Given the harsh realities on our nation's roads, we need to actively develop, test, and deploy these technologies for all users as quickly and safely as we can.

Despite the potential benefits CAV technologies may provide, there have been challenges in broadly deploying these technologies. The pathway and timeline to deployment remains unclear. Higher levels of vehicle automation, such as Levels 4 and 5⁴, appear costly to develop and it may be years before those vehicles are commercially available. Also, state DOTs are uncertain of the physical and digital infrastructure needed to support higher levels of automation. It is reported that the public remains unfamiliar and skeptical of the technologies and the potential for shared ownership models. There has also been much uncertainty surrounding the 5.9 Gigahertz (GHz) safety spectrum for transportation. And the CAV industry continues to evolve, consolidate, and change.

With challenge also comes opportunity. In Iowa, my vision for deploying automated transportation technologies has taken a two-pronged approach focused on the drivers of today and the automated vehicles of tomorrow. In supporting the drivers of conventional vehicles including those with Advanced Driver Assistance Systems (ADAS) in production today, and the more fully automated driving systems of tomorrow, Iowa has several strategies to promote readiness for automated transportation and the deployment and integration of connected and automated vehicles and devices. These include:

1. *Planning & Visioning*—We have developed a common vision and plan to guide, support, and inform the Iowa DOT and our partners as emerging technologies are being developed and deployed on Iowa's public roads⁵.
2. *Stakeholder Engagement*—We created the Iowa Advisory Council on Automated Transportation (AT Council)⁶ to engage a broad cross section of Iowa stakeholders on the development and deployment of emerging technologies. Iowa's AT Council works to keep stakeholders informed, capture recommendations, and align initiatives for automated transportation in our state.
3. *Policy & Legislation*—Iowa has enacted state laws that support the adoption of CAV technologies such as a vehicle title and registration framework, an automated driving systems framework, personal delivery devices, and enabling statutes for automated truck platooning⁷. It is currently legal in Iowa for "driverless" vehicles to operate on Iowa's roads.
4. *Research, Development, and Testing*—In Iowa, research is a critically important element of our success, which is why we foster strong collaboration with our academic partners at the Iowa State University (ISU), Institute for Transportation (Intrans) and the University of Iowa (UI), National Advanced Driving Simulator (NADS).

Iowa's experience is not unique among the state DOTs. In October 2021, AASHTO adopted ten CAV Policy Principles⁸ we believe are fundamental to the safe and effective deployment of connected, automated, and cooperative⁹ vehicle technologies across our states and nation. Today, I would like to focus my testimony on five of these ten principles which are under the purview of this subcommittee:

1. A national strategy and vision are needed.
2. Advance equity, access, and quality of life for everyone.

³https://one.nhtsa.gov/About-NHTSA/Press-Releases/ci.nhtsa_v2v_proposed_rule_12132016.print. Accessed January 28, 2022. More information available here: <https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety>.

⁴Level 4 and 5 refer to the SAE Levels of Driving Automation. More information is available here: <https://www.sae.org/blog/sae-j3016-update>. Accessed January 28, 2022.

⁵<https://iowadrivingav.org/pdf/ATC-Vision.pdf>. Accessed January 28, 2022.

⁶<https://iowadrivingav.org/>. Accessed January 28, 2022.

⁷<https://www.legis.iowa.gov/legislation/BillBook?ga=88&ba=HF%20387>. Accessed January 28, 2022.

⁸American Association of State Highway and Transportation Offices (AASHTO). *AASHTO Connected and Automated Vehicle Policy Principles*. October 2021. Available at <https://cav.transportation.org/wp-content/uploads/sites/61/2021/11/CAV-Policy-Principles-v4-press.pdf>. Accessed January 28, 2022.

⁹There is no consistent and agreed to definition of connected, automated, and cooperative vehicle technologies. AASHTO uses the following as general definitions:

- Connected Vehicle (CV)—Technologies that enable two or more vehicles and/or roadway infrastructure elements to communicate with each other.
- Automated Vehicle (AV)—Vehicle-based technologies that enable automation of traditional drive operational functions to occur as defined by SAE J3016 Levels of Driving Automation.
- Cooperative Vehicle—The integration of CV, AV, and other technologies that enable users of the transportation system (vehicles, pedestrian, bicyclists, etc.) to cooperatively operate.

3. The future is connected and automated.
4. Leadership is crucial to foster industry collaboration and community engagement.
5. Promote innovative Federal infrastructure investment.

1. A NATIONAL STRATEGY AND VISION ARE NEEDED

AASHTO believes there is an urgent need for a coordinated national strategy which includes a vision and roadmap for CAV deployment and integration into our nation's roadways. The vision and strategy must be developed collaboratively, with active input from Federal agencies, IOOs, industry, communities, local governments, and other transportation stakeholders, representing the populations their respective transportation systems serve.

Connected and automated vehicles technologies will be disruptive to our society and surface transportation system, and it is accelerating. Because the safety and mobility benefits are potentially enormous, realizing those benefits requires clear strategic direction, sustained programs, ongoing cross-sector dialogue, and focused activities. In Iowa, this begins with visioning and planning to assess needs, make informed decisions, and focus investments while considering broad perspectives from key stakeholders and the public.

For example, the Iowa DOT has developed the Iowa AT Vision¹⁰ and the Iowa DOT Cooperative Automated Transportation plan¹¹ which includes a variety of tactical activities such as the following:

1. Preparing our communities and infrastructure by making pavement markings wider and brighter to improve visibility for humans and automated systems.
2. Working with local agencies to develop planning guidance for CAV technology in comprehensive plans and zoning guidelines, as well as working to address environmental justice concerns by ensuring equitable access to transportation services.
3. Monitoring industry trends and advancements to identify how they might impact CAV usage on public roads, including the growing automation of farm equipment.
4. Engaging with economic and education leaders to assess how the future labor market may need to adjust in response to greater automation in vehicles for both passenger and freight movements.
5. Working with law enforcement, first responders, driver/vehicle licensing staff and other roadway safety community leaders to learn more about the impacts of the technologies on existing systems and processes such as our crash reporting procedures.

In similar fashion to the Iowa AT Vision and IOWA DOT CAT Plan, it is imperative that we develop a vision and strategy at the national level so that the entire transportation community knows what we are all striving for. Domestic and international models have shown how independent, collaborative non-governmental organizations can help lead these efforts. In addition, AASHTO and the state DOTs remain committed to working with the United States Department of Transportation (USDOT) and others in this area to help frame the enabling policies and regulatory environment necessary for CAV technologies to integrate seamlessly across jurisdictions and modes.

2. ADVANCE EQUITY, ACCESS, AND QUALITY OF LIFE FOR EVERYONE

CAV technologies have the potential to improve mobility, access, and equity and help engage disadvantaged and marginalized communities. IOOs and their partners recognize the role transportation plays broadly in society, its ability to connect communities, as well as the historic inequities from the 20th century when building out the nation's transportation system.

In the United States, CAV technologies need to benefit all users of the transportation system regardless of their income levels or geographic location. We are addressing this head-on in Iowa where our research partners at the University of Iowa National Advanced Driving Simulator were awarded one of the eight Automated Driving System (ADS) demonstration grants from USDOT¹². While 19 percent of Americans live in rural areas, 68 percent of our nation's total lane miles are in rural

¹⁰ <https://iowadrivingav.org/pdf/ATC-Vision.pdf>. Accessed January 28, 2022.

¹¹ <https://iowadot.gov/tsmo/service-layer-plans>. Accessed January 28, 2022.

¹² <https://www.transportation.gov/av/grants>. Accessed January 28, 2022.

areas, and 45 percent of all traffic related fatalities occur on rural roadways¹³. Iowa's population is aging, and it remains paramount that older individuals have the ability to get to the important services they need, such as healthcare which is being regionalized. The ADS for Rural America project is a demonstration project that involves a highly automated shuttle bus with advanced sensors. This automated vehicle is now being driven on all types of rural roads in Iowa including gravel roads and paved unmarked roadways. The goal is to understand the unique challenges that rural roadways present for automated vehicles as well as identifying opportunities for advancing automation so that it improves safety and mobility for everyone, especially the mobility challenged populations in rural America.

Although we are learning a lot, this project is one example of where further research and understanding is needed. Future projects need to focus on supporting equitable investments, policies, and engagement strategies such that CAV technology investments advance community-driven needs and increase access to desirable mobility options. It is my hope that projects such as this one in rural Iowa, and others like it throughout the United States, will lead to the promotion of best practices and approaches for the deployment of CAVs that are equitable, with the benefits widely available to all members of our society.

3. THE FUTURE IS CONNECTED AND AUTOMATED

To fully realize the benefits of automated transportation, AASHTO member states believe that vehicles must be more than automated, they must also be connected. Connected vehicle technology is key to ensuring automated vehicles have the redundant safety measures in place to advance AASHTO's goals of a safe, mobile, equitable and efficient transportation system. AASHTO continues to strongly support the preservation of the 5.9 GHz spectrum to advance safety and realize the benefits of connected vehicle technologies. From our interactions with other nations across the globe, we are aware that others have set aside bandwidth in the 5.9 GHz spectrum. We are also aware that some nations appear to be further along with respect to readiness and integration of advanced technologies into the roadway environment. These developments have the potential to put the United States at a competitive disadvantage, a harsh reality that can be remedied with bold action.

In Iowa we strongly support strategies that connect vehicles to the infrastructure and one another. While the industry as a whole addresses the technical and engineering aspects of making connected vehicle technology a reality, we are focused on two key areas that will enable a connected vehicle future:

1. *Digital Infrastructure and Data*—Iowa DOT continues to deploy fiber optic cable and wireless communications with our partners at the Iowa Communications Network and the private sector, and extend our communications network to inform the travelling public through connected infrastructure. We are also working with Iowa State University to study advanced wireless communications that hold the potential to take Vehicle-to-Everything (V2X) communications to the next level. We are also data centric and are implementing new data streams, like connected vehicle hard braking and hard acceleration data, that reveal real-time operations and flag potential safety issues. We are carefully evaluating our approach towards the design and operation of Iowa's transportation system to accommodate human mistakes and injury tolerances to avoid fatal and serious injuries.
2. *Work Zones & Maintenance Operations*—The management and maintenance of our surface transportation system is constant, and work zones and maintenance operations are occurring nearly 24/7 in our state. These operations can be a challenge not only for human operators but especially for vehicle systems that support drivers or those that are automated. In response to this, we are focused on improving our work zones through improved data, awareness, motorists' feedback, and performance analytics. In fact, we are providing more information to connected vehicles through adoption of the USDOT work zone data exchange and through data feeds that private companies (e.g., Waze) are using to produce visual and audible warnings like "work zone ahead" or "snow-plow ahead". Standardized data streams like the work zone data exchange are anticipated to help commercial drivers avoid bottlenecks and improve operations, while assisting passenger vehicles with real time information about the driving environment ahead.

While vehicle connectivity is ideal, vehicle-to-infrastructure (V2I) and V2X technology poses challenges. AASHTO has recognized these challenges and has served as a leader to address them and bring the industry to consensus. It is critical that

¹³ <https://www.bts.gov/rural>. Accessed January 28, 2022.

we continue to develop the needed connected vehicle technologies and supporting infrastructure because I believe, as well as many of the other state DOTs, that we cannot fully realize the benefits of automated vehicle technologies without vehicles being connected and cooperating with each other.

4. LEADERSHIP IS CRUCIAL TO FOSTER INDUSTRY COLLABORATION AND COMMUNITY ENGAGEMENT

Strong Federal leadership is critical to convening industry, the public sector (including IOOs, local governments, and planning organizations), and other stakeholders and partners to ensure strong coordination and collaboration and ensure the public and private sectors work together to safely deploy technologies that meet community needs. We need to engage across government, industry, academia, regions, and communities to ensure our efforts are interoperable and aligned. It is critical that we build off previous national dialogues, continue to collaborate, convene, and share information among IOOs, local governments, industry, researchers, communities, planning organizations and other stakeholders. We must inform and engage communities to build trust and awareness of CAVs.

Leadership is critical at all levels of government and in both the public and private sectors. At the state level, Iowa is taking a leadership role to collaborate with other states and the federal government in national and regional efforts to prepare for and support the deployment of CAV technology. The Iowa DOT is one of several state DOTs that is also responsible for driver licensing, driver education and vehicle title and registration. We have been active with the American Association of Motor Vehicle Administrators (AAMVA) to work across state lines on matters of driver education, vehicle registration, and law enforcement. Iowa is one of the first states in the nation to update our title and registration system to identify the ADS capabilities of a vehicle and tie that to the official vehicle record.

At the regional level, I co-sponsor an effort for the Mid-America Association of State Transportation Officials (MAASTO), which includes 10 states of the upper Midwest (Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin) which has developed a ten-year regional strategy for CAV deployment and integration. The CAV Committee for this group works to support the regional strategy and has focused their tactical approaches on organizational readiness, data sharing, planning, coordination, and policy issues. Regionally, mid-western states are interested in leading the nation with advanced transportation technologies to help move our products to market faster and cheaper while ensuring our travelers are safe.

Finally, at the national level, I am a tri-chair of the Cooperative Automated Transportation Coalition, a partnership between AASHTO, ITS America, ITE, and FHWA. The CAT Coalition brings together the private sector, IOOs, and government agencies (federal/state/local) with the aim of coordinating our efforts to safely and efficiently deploy connected and automated transportation technologies¹⁴.

It is vitally important that the federal government and specifically the USDOT continue to join in supporting these national, regional, state, and local efforts. The federal government and the USDOT are uniquely positioned to facilitate and sustain a technically informed and objective collaboration effort. Federal leadership can ensure national consistency in systems engineering and architecture to guarantee interoperability and standardized levels of safety across state lines. We value the participation of the USDOT agencies and will move forward as needed within states and local communities, because the technology continues to move ahead.

5. PROMOTE INNOVATIVE FEDERAL INFRASTRUCTURE INVESTMENT

AASHTO supports more flexible and dedicated funding to advance CAV technologies. We need to fund both the digital and physical infrastructure that enhances safety while also supporting technologies that advance CAVs. The Infrastructure Investment and Jobs Act (IIJA) provides a significant investment in the deployment of broadband technologies which could be used to support a CAV ecosystem throughout the United States. And, other parts of the law enable state DOTs to spend federal funding on CAV technologies. However, as states begin or continue to pursue connected infrastructure initiatives, it is important that federal infrastructure and transportation funding continue to give states the flexibility to invest in planning and improvements to support CAV deployment, whether through the new provisions in the IIJA or through traditional federal transportation programs.

¹⁴More information about these efforts are document at the CAT Coalition website: <https://transportationops.org/CATCoalition>. Accessed January 28, 2022.

Federal funding for advanced transportation technologies are frequently dispensed through discretionary grants. As the technologies become more widespread and as all states seek to invest in their physical and digital infrastructure, the federal funding mechanisms will need to be reexamined. The national focus on electric vehicles and the needed vehicle charging infrastructure in the IIJA is representative of the level and focus of investment necessary to advance CAV technologies. Smart, efficient investment in these technologies will help save lives and will have a dramatic effect on the economic prosperity of our communities and our nation.

CONCLUSION

In conclusion, I want to emphasize some key messages that are the foundation of my testimony. First, state DOTs are preparing for a future with connected and automated vehicles, but there is a lot of uncertainty of what the future will ultimately be. The path and timeline to deployment is unclear for many different reasons with the CAV industry continuing to evolve, consolidate, and change on an almost daily basis. Steadfast to these uncertainties is the fact that state DOTs, as critical surface transportation IOOs, are absolutely dedicated to supporting the safe deployment of a connected, automated, and cooperative vehicle ecosystem where benefits are seen across all of the states and throughout the population.

Second, safety is absolutely paramount. CAV technologies must be deployed so that they improve the safety of our roadway system and the users of it. On January 27, 2022 USDOT announced the National Roadway Safety Strategy which outlines the Department's comprehensive approach to significantly reducing serious injuries and deaths on our Nation's highways¹⁵. Two important aspects to achieving success of the strategy are Safer Roads and Safer Vehicles. I believe that CAV technologies must be an integral part of this effort and can be another tool for our industry to achieve success in improving the safety of our transportation system.

Third, numerous challenges remain that range from technological to economic to political. These are significant challenges, but ones that we can overcome as an industry if we all work together. Thus, we need the federal government as an integral partner. We need the technology developers, vehicle manufacturers, and IOOs collaborating with each other to get the safety technology deployed. We need the IOOs at the state and local level to ensure equity in how the technology get used. Finally, we need to work together to determine how deployment will be funded.

Finally, I want to end my testimony with three actions the federal government can initiate today to uniquely assist all state DOTs and other IOOs in the successful deployment of connected and automated vehicle technologies:

1. *Continue to Foster Collaboration and Partnerships*—The federal government plays a crucial role to ensuring the safe and efficient deployment of these technologies. AASHTO, ITE and ITS America are right now actively examining how a coalition organized around automation and emerging technologies could function. It is critical that USDOT continues to support such an effort.
2. *Develop a National Strategy and Vision*—Engage the public, private, and academic sectors to develop a vision for CAV and a national strategy for achieving that vision. Congress can foster progress by calling/directing USDOT to facilitate activities which lead to this vision and strategy, and fund programs to support these purposes, including gap closing research, development, and technology. AASHTO's CAV Policy Principles include recommendations on this topic and we stand ready to work with this committee to achieve this action.
3. *Preserve the Needed Communication Spectrum*—AASHTO continues to advocate for reserving the entirety of the 5.9 GHz safety spectrum for transportation use. Congress could provide much needed certainty by working within their authority to continue to reserve the safety spectrum to ensure the deployment of life-saving connected vehicle technologies. Reserving this spectrum for consistent use would put our country on par with what is happening in Europe and Asia so that we can continue to lead in this critical space.

In Iowa we will continue to grow our leadership in this space and continue our strong collaborations around the United States and the world so that we will have the safest vehicles and roads for all transportation users. Nationally, AASHTO will continue to engage key public and private stakeholders towards development of a vision for CAV and a national strategy for realizing such a vision.

Thank you again for the honor and opportunity to testify today on behalf of AASHTO and the Iowa DOT, and I am happy to answer any questions.

¹⁵ https://www.transportation.gov/sites/dot.gov/files/2022-01/USDOT_National_Roadway_Safety_Strategy_0.pdf. Accessed January 28, 2022.

Mr. DEFAZIO. OK, thank you, Mr. Marler.

We would now move to John Samuelsen, international president, Transport Workers Union of America.

John, you are recognized for 5 minutes.

Mr. SAMUELSEN. Thank you, Chair Norton, Ranking Member Davis, Chair DeFazio, and Ranking Member Graves, for providing us this opportunity to present our views on autonomous vehicle technology.

As president of the Transport Workers Union of America, I am here representing more than 150,000 working people who are on the front lines of our passenger and freight transportation systems. These members include schoolbus workers, transit operators, mechanics, and other workers serving communities across the country. Our members are the ones most at risk of job loss and displacement if automated vehicles are deployed without a clear Federal framework, or in ways that undermine workers and jobs.

This committee's leadership in crafting AV legislation is absolutely essential for the House to advance an AV proposal centered on the safety and economic security of all road users. Ensuring safety, protecting transport workers' jobs and rights, and prioritizing investment in our transportation network are all core to this committee's work.

Let me be clear: the TWU fully supports pro-worker, pro-safety technology, innovation, and policy. We frequently spend our own capital at the bargaining table to force our employees to install automatic braking, blind spot detection, and other safety and driver assist innovations. We would strongly endorse legislation that regulates AV technology, holds new technologies to our existing safety standards, and ensures that this industry creates and sustains good union jobs in America.

Innovation and automation are not new to our union or our members. The New York City subway ran a fully automated train across Manhattan from 1962 to 1964, a train maintained and overseen by the Transport Workers Union. This system and others like it gave rise to Federal transit worker protections. Standards like these ensure that workers are treated fairly, have access to necessary training, and can transition as jobs change due to technology. And they have made our transportation sector a major hub for the solid, blue-collar jobs that power strong communities and our economy.

While the specific features or equipment may be different in 2022 than in 1964, this approach has empowered workers for generations, and should not change. The same is true of our safety policies. The DOT has successfully integrated tens of thousands of new pieces of equipment, vehicles, and processes into our transportation systems across every mode. TWU members have worked with regulators to transition from rotor blades to jet engines, to Positive Train Control, and most recently, toward zero-emission buses.

As a country, we have always fought to ensure that these innovations not only meet, but exceed our existing safety standards. AVs must be held to this same level of accountability. AV operators and manufacturers must demonstrate their ability to improve safety, and our regulations must hold them accountable to any promised safety improvements.

As automated technology has been integrated into other modes, focus has been centered on safety requirements around qualified, licensed, trained professionals to operate commercial vehicles. Airline pilots, railroad engineers, and ship captains already work with automation, and regularly assume control as the situation demands. Bus, subway, and truck operators play an equivalent role in surface transportation, and our Federal AV policy must declare these onboard workers as the essential element for safe roads and transit operations. No level of vehicle automation should ever replace them.

My written testimony provides specific recommendations on several issues that AV legislation should address, including elevating workers' voices in developing and implementing new technologies, ensuring any transition to AVs creates and sustains good union jobs across the entire spectrum, and reforming DOT to create a unified approach to regulating automation across all of its modal agencies to ensure workers are supported as new technologies arrive.

TWU members and all transportation workers are counting on our elected leaders to fight for our jobs and our safety. This committee has an opportunity now to lead the way as we integrate the next generation of transportation technology.

Thank you for giving me the opportunity to address these issues here today, and we look forward to your questions.

[Mr. Samuelsen's prepared statement follows:]

Prepared Statement of John Samuelsen, International President, Transport Workers Union of America, AFL-CIO

Thank you, Chair Norton, Ranking Member Davis, Chair DeFazio, and Ranking Member Graves for providing us this opportunity to present our views on the future of autonomous vehicle (AV) technology. The Transport Workers Union of America (TWU) represents more than 150,000 working people who are on the frontlines of our passenger and freight transportation systems. These members include bus operators, mechanics, and other transit workers serving both large and small urban areas across the country. In New York City, Philadelphia, San Francisco, Houston, Miami, Columbus, Ann Arbor and many other areas, our members are the ones most at risk of job loss and displacement if automated vehicles are deployed haphazardly or in ways that undermine workers' interests. As this committee considers legislation that addresses how and if AVs are integrated into our transportation system, the decisions you make will have profound effects on the frontline employees, passengers and motorists, and on the future of mobility across America.

At the start, let me be clear: the TWU fully supports pro-worker,¹ pro-safety² technology. We frequently spend our own capital in bargaining to force our employers to install automatic braking, blind-spot monitoring, and other key technologies that empower workers to perform their jobs safely and efficiently. We would strongly endorse legislation that regulates the AV industry, holds new technologies to our existing or higher safety standards, and ensures that this industry creates and sustains good, union jobs in the United States. We look forward to working with this committee and others to advance new technology that improves the quality of life for transportation workers.

To that end, we must acknowledge that today's transportation sector is at a critical moment as new technologies, including automation features, mature and prepare for wide scale deployment. This development necessitates active involvement and oversight from the DOT—a shift from the Department's recent laissez faire ap-

¹ <https://ttd.org/policy/letters-to-congress/labor-principles-for-autonomous-vehicle-legislation/>

² TWU has endorsed the Autonomous Vehicle Tenets, Advocates for Highway and Auto Safety, November 30, 2020, a comprehensive AV safety blueprint: <https://saferoads.org/wp-content/uploads/2020/11/AV-Tenets-11-24-20-1.pdf>.

proach to emerging technologies.³ Just as with past transportation technological advancements, building coherent, consistent regulations now will ensure that AVs are deployed safely and integrated into our system in a way that preserves workers' rights and creates good, union jobs. Without a strong regulatory structure, in contrast, this technology poses an immediate threat to the safety and stability of transit and freight systems across the country.

Innovation and automation are not new to our union or our members. The New York City subway system ran a fully-automated train across Manhattan from 1962–1964, a train maintained and overseen by TWU members. Our mechanics are, right now, transitioning to electric buses—a completely different system than we've used for the past century. We have experienced thousands of technological changes, big and small, and have always provided the experience necessary to keep our systems safe and operating at maximum capacity. We've done this through representation, collective bargaining, and government action to develop our workforce, require the highest safety standards, insist on equity and inclusion, and demand a just transition to the next generation transportation technologies. 21st-century technologies, including AVs, should be no different. The DOT and all of our transportation systems have a set of standards and practices that work for these transitional moments and do not come at the expense of transportation safety, affordable and accessible public transit, or good, union jobs. We should adapt and apply this system to regulate AVs on our roads and in our transit systems.

This sincere belief—that we can build and maintain a pro-worker innovation policy as a country—leads us to reject several arguments that have been made by some tech advocates and others. First among these is the “with us or against us” mentality that seeks to force a conflict between innovation and workers. Our members work with technology every day—they rely on it to do their jobs and to keep them safe. Any and all technologies that facilitate their work is, by definition, pro-worker and our members fight, on a daily basis, to deploy more of this kind of technology into our systems. However, new ideas are not synonymous with good ideas. AV technologies that haven't been properly evaluated and scrutinized by independent federal safety regulators, technologies that attempt to cut corners to address their own limitations, and technologies that are intentionally designed to displace workers should all be suspect. Moreover, we have serious concerns that, without strong federal regulation, we face a transportation future that is strictly at odds with the hundreds of billions of federal dollars that this committee has invested into safety, congestion mitigation, air quality improvement, and equitable access to safe and reliable public transit through the surface transportation program.

Our future transportation systems should be built for the users—whether they be in vehicles or sharing the road with them—and frontline transportation workers, not companies.⁴

The TWU also rejects arguments of those who claim that any limitation on innovation somehow creates a global competitive disadvantage for our nation. We know that auto manufacturers, technology companies, and startups, buoyed by significant federal investments, are pouring billions into autonomous vehicles. General Motors and Ford alone have said they'll spend a combined \$65 billion on autonomous and electric vehicles through 2025. These and other investments by large companies such as Google AV spinoff Waymo have led to significant advancements that are already on our roads and highways. Clearly, we are in no danger of falling behind on idea generation. We are at risk, however, of losing hundreds of thousands of manufacturing and frontline transportation jobs if Congress fails to act decisively and the AV industry is left completely unregulated. The public interest in AVs is in the number of good, union jobs the industry creates in America and the safety benefits the technology ultimately delivers. Tellingly, we have seen no plan from the most vocal proponents of AV deployment that would condition federal support or non-intervention on requirements to produce jobs or meet promises on safety.

As Congress considers AV legislation, we will be advocating, together with the other transportation unions and our allies, for a robust title from this committee. This title must establish clear benchmarks for safety regulation, retention and creation of good jobs, data collection and transparency, and ensure that a strong worker voice is present—early and throughout the innovation process—as AVs are developed and implemented.

³ See TWU comments regarding Ensuring America's Leadership in Automated Vehicles Technologies: Automated Vehicles 4.0. DOT-OST-2019-0179-0028; https://downloads.regulations.gov/DOT-OST-2019-0179-0028/attachment_1.pdf

⁴ John Samuelsen, *The Future of Transit Should Be Determined by the People, Not Big Tech*, September 2, 2020, Morning Consult: <https://morningconsult.com/opinions/the-future-of-transit-should-be-determined-by-the-people-not-big-tech/>.

With this backdrop, the TWU offers the following recommendations for a federal response to the future of AV deployment.

A WORKER- AND SAFETY-CENTRIC TRANSPORTATION AND INFRASTRUCTURE
COMMITTEE TITLE MUST BE A PART OF ANY HOUSE AV LEGISLATION

The TWU and other unions have actively made the case that AV legislation must uphold and boost safety standards and create good, union jobs. Neither of these goals are possible without a comprehensive title written by this committee.

Already our transportation network is dotted with AV experiments that have placed numerous, unproven autonomous passenger and freight vehicles of various sizes and configurations on our roads. It is critical that this committee meet the moment as we see a deluge of accidents from these vehicles while suffering through a significant lack of transparency and available data for proper analysis. AV operations need federal regulation and oversight. There are 9.1 self-driving car accidents per million miles driven versus 4.1 per million miles among regular vehicles.⁵ These are not just statistics to be analyzed and debated; they are a warning sign to lawmakers and regulators that rigorous, enforceable regulations are needed before we unleash millions of AVs onto our roads and into our transit systems.

DOT'S TRANSPORTATION INNOVATION PRINCIPLES PROVIDE A STRONG FOUNDATION

Secretary of Transportation Pete Buttigieg has recently unveiled a new set of principles around transportation innovation.⁶ These principles serve as a powerful backdrop for how the federal government can use its authority and resources to ensure shared prosperity and a “seat at the table” for frontline workers as new transportation innovations, including AV applications, are developed and implemented. We believe this vision represents a necessary turning of the page by the DOT from the previous Administration’s ill-advised, hands-off approach to AV oversight by putting workers and job creation at the center of the innovation development process. Core elements of these principles include:

- Creating high quality jobs and increasing opportunity for all Americans.
- “Empowering workers” by expanding access to skills, training and the “choice of a union” as well as giving workers a “seat at the table in shaping innovation.”
- Allowing for experimentation but requiring open data and transparency to ensure we learn from both successful and failed deployments.
- Forging partnerships with the private sector while protecting the “interests of the public, workers, and communities” and remaining “technology neutral.”

The TWU has publicly praised this approach⁷ and believes a government-wide philosophy that mirrors these principles will begin to change the trajectory of emerging technology and how it affects workers and jobs. In particular, the DOT’s new principles are consistent with the objective and values that our union has emphasized as we continue to make the case for worker-centered AV policies. We urge this committee to embrace the Administration’s new principles as you craft AV legislation.

A QUALIFIED HUMAN OPERATOR MUST BE ON-BOARD ALL PASSENGER BUSES AND
OTHER COMMERCIAL USE VEHICLES REGARDLESS OF LEVEL OF AUTOMATION

Our nation’s public transit sector is a centerpiece of Americans’ mobility needs. These services have always been about providing access and opportunity for everyone. They connect people to their jobs, communities, and our national economy. Without these services, millions of Americans will suffer severe social and economic consequences. At the core of these services are the essential workers who safely operate our vehicles, provide customer service, report issues to law enforcement, enable accessibility features, and otherwise aid riders in the journeys. These workers perform all of these duties simultaneously and professionally; they manage the unexpected and the dangerous operations in large and small ways under often difficult circumstances. Just as in aviation and rail, these workers serve a critical safety role that cannot be replaced by automation.

⁵The Dangers of Driverless Cars, May 5, 2021, The National Law Review: <https://www.natlawreview.com/article/dangers-driverless-cars>.

⁶US DOT Innovation Principles, as released in January 2022: <https://www.transportation.gov/priorities/innovation/us-dot-innovation-principles>.

⁷TWU President John Samuelsen statement in response to the US DOT innovation principles: <https://www.twu.org/twu-president-samuelsen-dot-innovation-principles-will-ensure-transportation-workers-have-a-seat-at-the-table/>.

The Transportation and Infrastructure Committee has already noted the perils of overreliance on automation in its report on the Boeing 737-MAX crashes. The report highlights that the malfunctioning system which caused these crashes overruled commands from the pilots that would have saved hundreds of lives. Other pilots who faced the identical malfunction ultimately survived by simply turning off the failing system.⁸ Automated systems must have this human oversight in order to truly be safe.

Just a few miles from the Capitol building, 9 people, including the train operator, were killed 52 injured in 2009 due to WMATA's overreliance on automation. The National Transportation Safety Board (NTSB) found that "the Metrorail automatic train control system stopped detecting the presence of [a stopped train] . . . and allowed speed commands to be issued to [the following train which struck the back of the stopped train]." The record of the investigation shows that the operator of the striking train saw the stuck train ahead of her and attempted to stop her train but was overruled by the automated systems.⁹

Already, we are seeing certain interests use terms like "monitor" to describe the workers who remain on-board during AV pilots. Our members and all transit workers are not monitors; they are safety professionals and sometimes first-responders who keep riders safe. While a bus or van may one day achieve Level 4 or 5 automation, that technological capability does not eliminate the need for a qualified operator on-board every vehicle, any more than the autopilot features in commercial aircraft at 35,000 feet should ever replace two skilled pilots in the cockpit.

TRANSPORTATION LABOR'S AV PRINCIPLES

TWU has joined 34 other unions to develop the "Labor Principles for Autonomous Vehicle Legislation."¹⁰ This is an important resource for the committee as you write AV legislation as it provides specific recommendations. These principles provide a sensible approach to AV's focused on:

- ensuring Congress and the DOT establish and enforce vigorous safety standards;
- treating commercial applications of AV's differently to reflect the safety-sensitive work performed by commercial operators of buses, trucks and smaller vehicles such as vans, delivery bots and other alternative design vehicles;
- ensuring there is a workforce plan that advances together with any AV bill;
- explicitly protecting consumer rights, equity and accessibility,
- and committing to clear policies that ensure the AV manufacturing sector creates US union jobs across the entire supply chain through strong Buy American policies and incentives to buy American- and union-made vehicles.

AV TECHNOLOGY REQUIRES CLEAR SAFETY STANDARDS AND TRANSPARENCY

TWU is deeply concerned that, in the absence of federal leadership and regulation, there will be too many companies that believe they are free to test or even implement their "driverless" technology whether or not it is safe to do so. We have witnessed the ongoing, public dispute between the National Transportation Safety Board (NTSB) and Tesla over the company's testing of "full self-driving" systems in its cars.¹¹ Let us be clear: the use of the term testing implies there are laboratory conditions. Actually, the laboratory is our roads and the NTSB is calling out Tesla for failing to respond to the agency's recommendations about "design shortcomings" in the wake of crashes involving Tesla automated features. NTSB Chair Jennifer Homendy spoke clearly about this concern¹²:

It's clear that if you're marketing something as full self-driving and it is not full self-driving, and people are misusing the vehicles and the technology, you have a design flaw and you have to prevent that misuse . . . And part

⁸ <https://transportation.house.gov/imo/media/doc/2020.09.15%20FINAL%20737%20MAX%20Report%20for%20Public%20Release.pdf>

⁹ NTSB/RAR-10/02; <https://www.nts.gov/investigations/AccidentReports/Reports/RAR1002.pdf>

¹⁰ Transportation Trades Department, AFL-CIO, TWU and other affiliated unions, and the International Brotherhood of Teamsters, Labor Principles for Autonomous Vehicle Legislation: <https://td.org/policy/letters-to-congress/labor-principles-for-autonomous-vehicle-legislation/>.

¹¹ NTSB Chair criticizes Tesla over vehicle self-driving feature testing, Reuters, October 25, 2021: <https://www.reuters.com/business/autos-transportation/tesla-submits-partial-response-us-auto-safety-probe-memo-2021-10-25/>.

¹² NTSB Chair interview regarding Tesla's improper testing of "full self-driving" technology, CNBC, October 26, 2021: <https://www.cnbc.com/2021/10/26/ntsb-head-criticizes-teslas-self-driving-features-calls-them-misleading.html>.

*of that is how you talk about your technology. It is not full self-driving ... It's misleading.*¹³

This dispute should alarm the country and regulators. It underscores why Congress and the Biden Administration must act and gain control over the way this industry rolls out driverless technologies. There must be clear policy:

- Requiring any company to be held accountable for how it markets and tests AV technology;
- Mandates transparency and open data collection and reporting;
- Ensures crash and safety incident data are available in real-time and that the NTSB has the authority it needs to act forcefully;
- Scrutinizes how driverless technologies are sold and marketed to transit agencies, and
- Ensures the DOT regulates how transit agencies test these technologies given the safety implications for passengers¹³ that participate.

WORKERS MUST HAVE A SEAT AT EVERY TABLE AS NEW TECHNOLOGIES EMERGE

Workers must have, as Secretary Buttigieg has said repeatedly, a “seat at the table” throughout the innovation process. This means requiring, for example, transit agencies to work and negotiate with their unions in the decisions around testing and implementing new technology-enabled innovations, including AV vehicles.

Congress recognized the centrality of this issue as part of the recently passed Infrastructure Investment and Jobs Act.¹⁴ As a condition of federal aid for electric buses, transit agencies must conduct a review of their worker training needs and build a workforce training plan to ensure that mechanics, drivers, and others are learning to use new equipment rather than face displacement. The bill also allocates 5% of each federal grant for electric bus procurement towards implementing these plans. This Committee passed a version of this plan which would have also applied to AVs and other new technologies in transit.

If the policies and investments we advance are to create public good, they must center workers at every stage of the innovation process. Wherever AVs and other technologies are being developed and considered for adoption, the frontline people who will be directly affected should be at the table with a strong voice. Unions should be involved, as a matter of explicit policy, upstream in federal research and development programs. TWU has offered a set of common sense reforms that mainstream worker voice in the agency’s R&D programs.¹⁵

These principles can be achieved if they are anchored in strong policies and in the longstanding collective bargaining mechanisms that have been a cornerstone of how America prepares its workforce for advancements in transportation innovation. Transportation Secretary Pete Buttigieg shares our views, as reflected in an opinion article he wrote recently about the agency’s newly released innovation principles¹⁶:

Our innovation strategy must support workers, knowing that our choices will help to define whether any given technological development meets its potential to create economic benefits for all.

Experience teaches us that collective bargaining provides a proven platform for considering new technologies, addressing job threats and workforce transition and preparedness issues, and developing appropriate safety and training protocols. None of this will occur unless Congress advances sensible legislation and the Administration issues clear regulations that live up to the values of a truly worker-centered approach to AV development and adaptation.

UNIFIED OVERSIGHT AND COORDINATING MECHANISM NEEDED INSIDE THE US DOT

While the National Highway Traffic Safety Administration (NHTSA) has been the most active modal agency working on AVs recently, its mandate is limited and the technology is already being applied to larger, commercial vehicles outside of NHTSA’s purview. AVs in transit, trucking, and elsewhere (as well as aviation drones, autonomous maritime shipping, and other modes) require oversight and reg-

¹³Self-driving shuttle company ordered to stop carrying passengers after injury, The Verge, February 26, 2020: <https://www.theverge.com/2020/2/26/21154532/easymile-columbus-ohio-nhtsa-suspension-injury>.

¹⁴P.L. 117–58 Section 30018

¹⁵Transport Workers Union, comments to the Department of Transportation regarding the agency’s R&D programs, January 31, 2022. DOT-OST-2021-0160-001

¹⁶Secretary of Transportation Pete Buttigieg, in TechCrunch, Steering innovation toward the public good, January 6, 2022: https://techcrunch.com/2022/01/06/steering-innovation-toward-the-public-good/?utm_medium=TCnewsletter&tpcc=TCtransportationnewsletter.

ulation by the department. It is essential that the Department not only act immediately to regulate the entire scope of the industry, but that the actions taken by each of the DOT's constituent agencies are coordinated to support a unified approach to scrutinizing how or if these technologies are implemented.

The newly authorized Nontraditional and Emerging Transportation Technology (NETT) Council¹⁷ would serve well as the body responsible for this kind of work. The Council consists of the Administrators of the relevant agencies, as well as the Secretary's office. It is specifically charged with "coordinat[ing] the response of the Department of Transportation to nontraditional and emerging technologies." With some clear direction from Congress and additional authority specific to AVs, this group would be well suited to ensuring each of the modal agencies can move in tandem to preserve the public interest as autonomous technology increases its presence in our transportation systems.

CONCLUSION

The Transportation and Infrastructure Committee has set the standards for our transportation systems since the very first Congress. Your leadership—which directed the development of clipper ships, railroads, diesel engines, and hyperloops—is urgently needed as the DOT addresses emergent AV technologies. It is imperative that AV legislation is comprehensive, addresses gaping holes in our safety and cybersecurity regulations, directs the DOT and its modal agencies to close those holes, places limits on the use of waivers and exemptions from federal vehicle safety requirements, requires a qualified operator on-board in any commercial operations, mandates workforce involvement in development, testing and eventual deployment of AVs, normalizes transparency for planning and data collection and reporting, and ensures that the AV industry is an American industry employing US workers across the entire supply chain.

Thank you for giving the Transport Workers Union an opportunity to express our views and concerns regarding the future of AV technology deployment. We look forward to working with the committee to ensure the federal government steps up to this moment with a robust policy plan to properly regulate this emerging industry and protect the workers who are on the frontlines of our transportation system.

Ms. NORTON [presiding]. Thank you very much, Mr. Samuelsen. I would like to recognize Ms. Chase. Ms. Chase is president of the Advocates for Highway and Auto Safety.

Ms. Chase, you are recognized.

Ms. CHASE. Good morning, Chair Norton, Chair DeFazio, Ranking Member Davis, and subcommittee members. I am Cathy Chase, president of Advocates for Highway and Auto Safety, known as Advocates.

Thank you for holding today's hearing at a critical time, with motor vehicle crash fatalities skyrocketing to historic highs, despite a drop in vehicle-miles traveled since the onset of the pandemic. Fatal truck crashes also have been on the rise, increasing by 45 percent since 2009.

Automated, or driverless technology, including cars, trucks, and buses, is being offered as a potential way to reduce this mounting death and injury toll. However, it has yet to be fully developed, and its safety and numerous other impacts are currently unknown. In the short term, many safety solutions are available.

Since our inception in 1989, Advocates has strongly supported proven lifesaving technologies as standard equipment in all vehicles. These include airbags, seatbelts, electronic stability control to prevent rollovers, and rearview cameras. Advocates is deeply concerned about the rush to deploy undertested, unproven, and unsafe automated or autonomous vehicles, AVs, including trucks and

¹⁷P.L. 117–58 Section 25008

buses, while overlooking the need to advance current lifesaving solutions now.

The public also shares this concern about AVs. We commissioned a national public opinion poll last week. It revealed that 80 percent are concerned about sharing the roads with driverless cars.

[Slide shown.][†]

This distress is evenly expressed throughout the country.

An even greater concern of 85 percent was found for driverless trucks, and again, throughout the country.

[Slide shown.][†]

Yet, when asked if their concerns about driverless cars would be addressed if required to meet minimum Government standards, 60 percent responded yes.

[Slide shown.][†]

Since Congress held its first hearing on AVs nearly a decade ago, we have been urging adoption of standards. If the auto, truck, and tech industries can figure out how to build AVs, the U.S. Department of Transportation, or DOT, can figure out how to develop standards. Last month, DOT Secretary Buttigieg responded to a question on AVs during an interview, stating “We need to make sure that people who are weighing how to navigate a world of automated vehicles know that there is some baseline of safety that’s been established by regulation.” We share that view.

Without regulations, Government oversight, consumer information, and industry accountability, the safety of all road users is in peril. These inadequacies are contributing to a great deal of confusion about the capabilities of driverless vehicles versus cars with convenience features like adaptive cruise control with lane-keep assist. In turn, this has led to drivers misusing and over-relying on some technologies, which have resulted in fatalities and injuries.

Also, yesterday Tesla recalled 54,000 cars which were programmed to roll through stop signs.

The DOT clearly needs to step in and step up its oversight and regulatory responsibilities. This includes NHTSA immediately releasing the information it has been collecting since last June from automakers about cars with advanced technologies involved in crashes.

Advocates commends this subcommittee and the full committee for their Invest in America bill, which included numerous safety advances, some of which were included in the Infrastructure Investment and Jobs Act, IIJA. Two critical truck safety measures are the mandated rule on automatic emergency braking, AEB, for large trucks within 2 years, and a mandated upgraded standard within 1 year for rear guards to prevent horrific truck underride crashes. These and other directives must be a floor, not ceiling, by DOT.

The issuance of minimum standards for verified advanced driver assistance systems like AEB for all new vehicles must occur with expediency. These systems significantly reduce or mitigate crashes caused by many factors, including impaired, distracted, or drowsy

[†]The slides shown during Ms. Chase’s oral testimony are retained in committee files and are available online at <https://docs.house.gov/meetings/PW/PW12/20220202/114362/HHRG-117-PW12-Wstate-ChaseC-20220202-SD001.pdf>

driving. Moreover, they are the building blocks for the possibility of future driverless cars and trucks.

Upgrading infrastructure is also critical to advancing safety. The tragic bridge collapse in Pittsburgh last week is a stark example of this need. Adoption of a safe system approach, which includes infrastructure improvements and vehicle safety advances, was included in the IIJA, and quick implementation throughout the Nation is vital.

Additionally, research and data on the impacts of AVs on accessibility, workforce, transit, the environment, and other issues in this study directed by the IIJA must be completed to inform future policies.

In closing, we support rigorous testing, Government oversight, and industry accountability with the future goal of safe deployment of AVs, including autonomous trucks and buses.

In 2020, Advocates was joined by 60 groups representing labor, disability rights, emergency responders, law enforcement, bicyclists, pedestrians, smart growth, and others in developing the AV tenets. We urge the subcommittee to continue its safety leadership role by advancing these and other needed protections to improve the safety of all road users and our Nation's infrastructure. Thank you.

[Ms. Chase's prepared statement follows:]

Prepared Statement of Catherine Chase, President, Advocates for Highway and Auto Safety

OVERVIEW OF TESTIMONY

- Advocates for Highway and Auto Safety (Advocates) believes automated technology has the potential to be transformative in reducing our nation's mounting roadway death and injury toll. However, we are deeply concerned about the future of automated, or autonomous, vehicles (AVs) including trucks and buses. The lack of comprehensive federal performance standards, strong government oversight, adequate consumer information, and effective industry accountability imperils all road users who are currently unknowing and unwitting participants in the testing of experimental autonomous technology on public roadways.
- These inadequacies also have led to a great deal of confusion about AVs, advanced driver assistance systems (ADAS) and partial automation convenience features. In turn, the confusion has led to misuse and over-reliance on some technologies which have resulted in preventable fatalities and injuries. NHTSA issued Standing General Order 2021-01 to collect information from automakers about what is happening now with cars with ADAS and automated driving systems (ADS). It is incumbent upon NHTSA to release all this information to the public immediately.
- The issuance of minimum performance standards for verified ADAS technologies must occur with expediency. These systems have been proven to significantly reduce or mitigate crashes caused by many factors including impaired, distracted and drowsy driving. We cannot and must not wait for the future of AVs to reduce crashes, deaths and injuries.
- Advocates commends this Subcommittee and the full Committee for including safety advances in the Infrastructure Investment and Jobs Act (IIJA) including issuance of a final rule for automatic emergency braking (AEB) for large trucks within two years and a final rule for commercial motor vehicle (CMV) rear guards to prevent underride within two years. These and other directives must be a floor, not a ceiling, for what the U.S. Department of Transportation (DOT) issues.
- The tragic bridge collapse in Pittsburgh last week is the most immediate example of why our infrastructure must be maintained, improved and upgraded. Adoption of a Safe System Approach, which includes road safety infrastructure

upgrades, reducing speeds, post-crash management, and vehicle safety advances, was included in the IIJA and must be implemented throughout the nation.

- To ensure the safe development and deployment of AVs, including autonomous CMVs (ACMVs), commonsense protections and regulations must be put in place, including Advocates' AV Tenets. Additional safeguards are needed for ACMVs (starting on p. 13). We urge this Subcommittee to continue its safety leadership role by considering and advancing these recommendations to improve the safety of all road users and the integrity of our nation's surface infrastructure.

INTRODUCTION

Advocates for Highway and Auto Safety (Advocates) is a coalition of public health, safety, law enforcement and consumer organizations, insurers and insurance agents that promotes highway and auto safety through the adoption of federal and state laws, policies and regulations. Advocates is unique both in its board composition and its mission of advancing safer vehicles, safer motorists and road users, and safer infrastructure. We are deeply concerned about the future of automated, or autonomous, vehicles (AVs). Currently there are no federal performance standards for AVs, advanced driver assistance systems (ADAS), or partial automation convenience features. Understandably, there is a great deal of confusion among the public about these different categories. In an actual AV, the car is taking over the entire driving task, unlike ADAS and convenience features where a driver always must be engaged in the driving task. There are no AVs available to consumers at this time. ADAS include safety features presently offered in some vehicles such as automatic emergency braking (AEB), lane departure warning (LDW) and blind spot detection (BSD). The highly respected Insurance Institute for Highway Safety (IIHS) has found real-world significant crash rate reductions in vehicles with these technologies. Conversely, partial automation convenience features, such as adaptive cruise control (ACC) and lane centering used together, have not been proven to improve vehicle safety. According to IIHS President David Harkey, "[T]here is no evidence that [partial automation systems] make driving safer . . . In fact, the opposite may be the case if systems lack adequate safeguards."¹ Misuse of and overreliance on some technologies already have led to numerous fatal crashes.² The lack of strong government oversight, effective regulations, and industry accountability must change. Automated technology has the potential to be transformative in reducing our nation's mounting highway death and injury toll. This Subcommittee and Congress can lead the way to accomplish this goal with targeted legislative directives requiring regulatory and industry actions to address identified problems.

MOTOR VEHICLE CRASHES ARE A PUBLIC HEALTH CRISIS WHICH DEMAND IMMEDIATE ACTION

According to the National Highway Traffic Safety Administration (NHTSA), 38,680 people were killed in 2020³ and an estimated 2.74 million more were injured in traffic crashes in 2019.⁴ Recent data shows a deadly upward trend in traffic fatalities with projected increases in 2020 and the first half of 2021, despite a decrease in vehicle miles traveled during that period.⁵ It is anticipated that figures for the rest of 2021, which the U.S. Department of Transportation (DOT) is expected to release soon, will show additional increases.⁶ NHTSA currently values each life lost in a crash at \$11.6 million.⁷ Crashes, injuries, and fatalities occurring each year impose a financial burden of \$1 trillion in total costs to society in 2021 when ad-

¹ IIHS, IIHS creates safeguard ratings for partial automation (Jan. 20, 2022).

² Collision Between Vehicle Controlled by Developmental Automated Driving System and Pedestrian Tempe, Arizona, March 18, 2018, Accident Report NTSB/HAR-19/03 (Nov. 19, 2019); NHTSA Office of Defects Investigation Preliminary Evaluation PE21-020.

³ National Center for Statistics and Analysis. (2021, May). Early estimate of motor vehicle traffic fatalities in 2020 (Crash Stats Brief Statistical Summary. Report No. DOT HS 813 115). National Highway Traffic Safety Administration.

⁴ National Center for Statistics and Analysis. (2021, August). Traffic safety facts 2019: A compilation of motor vehicle crash data (Report No. DOT HS 813 141). National Highway Traffic Safety Administration.

⁵ Traffic Safety Facts: Crash Stats; Early Estimates of Motor Vehicle Traffic Fatalities for the First Half (January–June) of 2021, NHTSA, Oct. 2021, DOT HS 813 199.

⁶ U.S. DOT, U.S. Transportation Secretary Pete Buttigieg Announces Comprehensive National Roadway Safety Strategy (Jan. 27, 2022).

⁷ John Putnam, US DOT Deputy General Counsel, Guidance on the Treatment of the Economic Value of a Statistical Life (VSL) in U.S. Department of Transportation Analyses—2021 Update.

justed for inflation—\$292 billion of which are direct economic costs.⁸ This amounts to a “crash tax” on every person living in the U.S. of nearly \$900.⁹ In 2018, crashes alone cost employers \$72.2 billion.¹⁰

Fatal truck crashes contribute to this preventable toll and occur at an alarmingly high rate. In 2020, nearly 5,000 people were killed in crashes involving a large truck.¹¹ Since 2009, the number of fatalities in large truck crashes has increased by 45 percent.¹² Additionally, 159,000 people were injured in crashes involving a large truck in 2019, and injuries of large truck occupants increased by 18 percent since 2018.¹³ The cost to society from crashes involving commercial motor vehicles (CMVs) was estimated to be \$143 billion in 2018, the latest year for which data is available.¹⁴ When adjusted solely for inflation, this figure amounts to over \$150 billion.¹⁵ According to the U.S. Department of Labor, truck driving is one of the most dangerous occupations in the United States.¹⁶

ON THE POTENTIAL PATH TO AVs, PROVEN VEHICLE SAFETY TECHNOLOGIES SAVE LIVES

Before the pandemic, the motor vehicle crash death and injury toll already was extremely high, averaging 36,739 fatalities and 2.7 million injuries over the five-year span of 2015 to 2019.¹⁷ The recent uptick has brought a renewed national focus on these preventable tragedies. Fortunately, inexpensive and lifesaving solutions are readily available. What is lacking is implementation. This includes the U.S. DOT issuing minimum performance standards for proven and available safety technologies with urgency. The NHTSA has estimated that between 1960 and 2012, over 600,000 lives were saved by motor vehicle safety technologies.¹⁸

Advocates always has championed proven vehicle safety technologies to save lives. Advocates led the coalition that supported enactment of the bipartisan Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991¹⁹ which included a mandate for front seat airbags as standard equipment. As a result, by 1997, every new car sold in the United States was equipped with this technology and the lives saved have been significant. Airbags have saved an estimated 50,457 lives from 1987 to 2017, according to NHTSA.²⁰ Advocates continued to support proven lifesaving technologies as standard equipment in new vehicles in other federal legislation and regulatory proposals. These efforts include: tire pressure monitoring systems;²¹ rear

⁸ Economic costs include lost productivity, medical costs, legal and court costs, emergency service costs, insurance administration costs, congestion costs, property damage, and workplace losses.

⁹ As of January 2021, when costs are adjusted for inflation only and population estimates are brought current. See: “The Economic and Societal Impact of Motor Vehicle Crashes, 2010,” NHTSA (2015).

¹⁰ Cost of Motor Vehicle Crashes to Employers 2019, Network of Employers for Traffic Safety, March 2021.

¹¹ Traffic Safety Facts: Crash Stats; Early Estimates of Motor Vehicle Traffic Fatalities and Fatality Rate by Sub-Categories in 2020, NHTSA, Jun. 2021, DOT HS 813 118.

¹² *Id.* and Traffic Safety Facts 2018: A Compilation of Motor Vehicle Crash Data, NHTSA, Nov. 2020, DOT HS 812 981. Note, the 45 percent figure represents the overall change in the number of fatalities in large truck involved crashes from 2009 to 2020. However, between 2015 and 2016 there was a change in data collection at U.S. DOT that could affect this calculation. From 2009 to 2015 the number of fatalities in truck involved crashes increased by 21 percent and between 2016 to 2020, it increased by 5 percent.

¹³ Traffic Safety Facts: Research Note; Overview of Motor Vehicle Crashes in 2019, NHTSA, Dec. 2020, DOT HS 813 060.

¹⁴ 2020 Pocket Guide to Large Truck and Bus Statistics, FMCSA, Oct. 2020, RRA-20-004.

¹⁵ CPI Inflation Calculator, BLS, available at https://www.bls.gov/data/inflation_calculator.htm.

¹⁶ U.S. Department of Labor, Bureau of Labor Statistics, National Census of Fatal Occupational Injuries in 2020, USDL-21-2145 (Dec. 16, 2021).

¹⁷ National Center for Statistics and Analysis. (2021, August). Traffic safety facts 2019: A compilation of motor vehicle crash data (Report No. DOT HS 813 141). National Highway Traffic Safety Administration.

¹⁸ Lives Saved by Vehicle Safety Technologies and Associated Federal Motor Vehicle Safety Standards, 1960 to 2012, DOT HS 812 069 (NHTSA, 2015); See also, NHTSA AV Policy, Executive Summary, p. 5 endnote 1.

¹⁹ Pub. L. 102-240 (Dec. 18, 1991).

²⁰ Traffic Safety Facts 2018, A Compilation of Motor Vehicle Crash Data, DOT HS 812 981, NHTSA (Nov. 2020).

²¹ Transportation Recall Enhancement, Accountability, and Documentation (TREAD) Act, Pub. L. 106-414 (Nov. 1, 2000).

outboard 3-point safety belts;²² electronic stability control;²³ rear safety belt reminder systems;²⁴ brake transmission interlocks;²⁵ safety belts on motorcoaches;²⁶ rear-view cameras;²⁷ ADAS;²⁸ impaired driving prevention technology;²⁹ enhanced vehicle hood and bumpers to better protect vulnerable road users;³⁰ and, advanced head lamps.³¹

Additionally, Advocates has relentlessly championed technology to improve CMV safety and address persistent problems such as truck driver fatigue, a well-known and well-documented problem in the motor carrier industry. In fact, the National Transportation Safety Board (NTSB) repeatedly has cited fatigue as a major contributor to truck crashes.³² Advocates sought the installation of electronic logging devices (ELDs) to record drivers' hours of service (HOS) to increase compliance and thereby reduce driver fatigue and fatigue related crashes.

IMMEDIATE ACTIONS MUST BE UNDERTAKEN TO PREVENT CRASHES AND SAVE LIVES

It is a transformational time in surface transportation innovation with the availability of new safety technologies, known as ADAS, to prevent or mitigate crashes caused by numerous factors including distracted, impaired and drowsy driving, and protect drivers, vehicle occupants and other road users. These safety systems, such as AEB and LDW, stand in stark contrast to some partial automation driver convenience features, such as adaptive cruise control and lane centering used together which allow operators to remove their hands from the steering wheel or other dangerous actions. While AV technology continues to be developed, ADAS are available to immediately improve public safety. As NHTSA has stated, "[t]he prevalence of automotive crashes in the United States underscores the urgency to develop and deploy lifesaving technologies that can dramatically decrease the number of fatalities and injuries on our Nation's roadways."³³ The NTSB has included increasing implementation of collision avoidance technologies in its Most Wanted Lists of Transportation Safety Improvements since 2016.³⁴

The IIHS has found that:

- AEB can decrease front-to-rear crashes with injuries by 56 percent;
- LDW can reduce single-vehicle, sideswipe and head-on injury crashes by over 20 percent;
- BSD can diminish injury crashes involving lane changes by 23 percent;
- Rear AEB can reduce backing crashes by 78 percent when combined with rear-view camera and parking sensors;
- Rear cross-traffic alert can reduce backing crashes by 22 percent; and,³⁵
- Equipping large trucks with forward collision warning and AEB could eliminate more than two out of five crashes in which a large truck rear-ends another vehicle.³⁶

However, the widespread use of these technologies and realizing their significant lifesaving benefits are hampered by their limited availability to consumers. Often AEB is sold as part of an additional, expensive trim package along with other non-safety features, or included as standard equipment in high end models or vehicles. This practice hinders mass dissemination and safety equity by providing access only to those who can afford an upcharge of thousands of dollars. Additionally, segments

²² Anton's Law, Pub. L. 107-318 (Dec. 4, 2002).

²³ Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), Pub. L. 109-59 (Aug. 10, 2005).

²⁴ *Id.*

²⁵ *Id.*

²⁶ Moving Ahead for Progress in the 21st Century (MAP-21) Act, Pub. L. 112-141 (Jan. 3, 2012).

²⁷ Cameron Gulbransen Kids Transportation Safety Act of 2007, Pub. L. 110-189 (Feb. 28, 2008).

²⁸ Infrastructure Investment and Jobs Act, Pub. L. 117-58 (Nov. 15, 2021).

²⁹ *Id.*

³⁰ *Id.*

³¹ *Id.*

³² National Transportation Safety Board, 2016 Most Wanted List, accessed at [nts.gov/safety/mwl/Documents/MWL2016_Brochure_web.pdf](https://www.nts.gov/safety/mwl/Documents/MWL2016_Brochure_web.pdf)

³³ 85 FR 39976 (Jul. 2, 2020).

³⁴ NTSB Most Wanted List Archives, https://www.nts.gov/safety/mwl/Pages/mwl_archive.aspx.

³⁵ IIHS, Real world benefits of crash avoidance technologies, available at: <https://www.iihs.org/media/259e5bbd-f859-42a7-bd54-3888f7a2d3ef/e9boUQ/Topics/ADVANCED%20DRIVER%20ASSISTANCE/IIHS-real-world-CA-benefits.pdf>.

³⁶ IIHS, Study shows front crash prevention works for large trucks too, available at: <https://www.iihs.org/news/detail/study-shows-front-crash-prevention-works-for-large-trucks-too>

of the trucking industry have opposed requiring AEB in small to medium-sized trucks.

Moreover, there are currently no minimum safety standards to ensure the technologies perform as expected and needed. When consumers walk into auto showrooms to purchase a vehicle, a major expenditure for most families, they expect the assurances of minimum safety standards to protect them, as has been the case since the first federal vehicle safety regulation issued in 1966.³⁷ Also, consumers are keeping cars longer. In 2021, the average of age of vehicles operated on roads in the U.S. was 12 years.³⁸ As such, without federal regulations requiring ADAS as standard equipment, it will take far longer for these safety systems to be prevalent on our roadways. The current void of regulations for ADAS renders all road users vulnerable to needless dangers, including bicyclists, pedestrians and others.³⁹

Advocates commends this Subcommittee and the full Committee on Transportation and Infrastructure for including numerous provisions in the Infrastructure Investment and Jobs Act (IIJA), signed into law last November, that will improve safety and strengthen our nation's infrastructure. The law requires the U.S. DOT to issue a final rule within two years for AEB in large CMVs and the issuance of a Federal Motor Carrier Safety Regulation (FMCSR) to require drivers use AEB.⁴⁰ We urge the U.S. DOT to meet the statutory deadline for this standard and not delay regulatory action. However, this directive must be expanded to include all CMVs. Based on new truck sales data, limiting the installation of AEB to Class 7 and 8 trucks will potentially exclude over half a million Class 3–6 trucks every year. These vehicles travel on local streets and through neighborhoods everyday making millions of deliveries. Equipping these trucks with AEB will make neighborhood streets safer for pedestrians, bicyclists, children, older adults, people in wheelchairs and other vulnerable road users. Advocates also has consistently supported the use of speed limiting devices for CMVs because high speed crashes involving large trucks have the potential to be far deadlier than those that occur at lower speeds.⁴¹

We also commend the Subcommittee and full Committee for the inclusion of upgrading the performance standard for rear underride guards.⁴² This is long overdue as testing by IIHS has found that the largest trailer manufacturers far exceed the current federal standard.⁴³ Moreover technology is currently available that can prevent a passenger vehicle from traveling underneath the rear or side of a trailer and significantly increase the chances of survival. The NTSB has recommended rear, side, and front underride protection.⁴⁴ In 2017, IIHS performed its first tests of a side underride guard designed for an automobile.⁴⁵ The device bent but did not allow the car to go underneath the trailer, enabling the car's airbags and safety belt to properly restrain the test dummy in the driver seat. As such, U.S. DOT should require the installation of comprehensive underride protection (side and front) for the entire CMV.

In addition, the legislation provides funding opportunities for states and localities to implement a Safe System Approach that seeks to prevent traffic fatalities by minimizing roadway conflicts and reducing crash forces when they do occur. This is accomplished through measures such as reducing speeds, road safety infrastructure improvements and better post-crash management. Additional provisions in the IIJA that will improve public safety include requiring the establishment of a safe routes to school program for children, research focusing on vulnerable road users (VRUs), and measures to address multiple substance-impaired driving. Lastly, the IIJA includes directives to the U.S. DOT to conduct research on the impacts of automated, connected and platooned vehicles on infrastructure including wear on roadway pavements as well as a report to Congress on the existing and future impacts of AVs to transportation infrastructure, mobility, the environment, and safety. This information will be critical in determining future policies for this developmental technology.

In the short term, there are immediate surface infrastructure vulnerabilities which demand immediate attention. Just last week, at least ten people were injured when a well-travelled 52-year-old bridge collapsed in Pittsburgh. The most recent

³⁷National Traffic and Motor Vehicle Safety Act of 1966, Pub. L. 89–563 (Sep. 1966).

³⁸Robert Ferris, Cars on American roads keep getting older, CNBC (Sep. 28, 2021).

³⁹Note some ADAS may not be appropriate for certain CMV operations.

⁴⁰Pub. L. 117–58 (Nov. 15, 2021).

⁴¹Docket: FMCSA–2014–0083, Comment ID: FMCSA–2014–0083–4459.

⁴²Pub.L. 117–58 (2021). A list of all such provisions is attached as Appendix A.

⁴³IIHS, Topics. Large Trucks, Underride.

⁴⁴NTSB Safety Recommendations H–10–12, H–10–13, H–14–03, H–14–02, H–14–04.

⁴⁵IIHS, Side guard on semitrailer prevents underride in 40 mph test (Aug. 29, 2017).

inspection report for the bridge noted that it was in “poor” condition.⁴⁶ This was not the first time a major artery has failed in a major city in the U.S. In 2007, a bridge in Minneapolis collapsed killing 13 and injuring 145 travelers after the span had been deemed “structurally deficient.”⁴⁷ Overweight trucks disproportionately damage America’s crumbling infrastructure and threaten public safety. Yet, certain special interests continue to advocate for weakening federal limits on the weight and size of CMVs. Often these provisions are tucked into must pass spending bills evading public debate and the jurisdiction of this committee. Federal weight and size limits are essential to protecting truck drivers, the traveling public, and our nation’s roads and bridges. According to the 2021 Infrastructure Report Card from the American Society of Civil Engineers, America’s roads receive a grade of “D” and our bridges were given a “C.”⁴⁸ Nearly 40 percent of our 615,000 bridges in the National Bridge Inventory are 50 years or older, and one out of 11 is structurally deficient.⁴⁹

We urge the U.S. DOT to move swiftly to implement the IIJA, including issuing the mandated standards immediately, and to view the safety requirements as a “floor” rather than a “ceiling” for what must be achieved. Critical to the success of the National Roadway Safety Strategy (NRSS), released by the U.S. DOT last week, will be swift implementation of Congressional mandates and other identified solutions which have been proven to prevent crashes and save lives.

EXPERIMENTAL AUTONOMOUS TECHNOLOGY REMAINS UNPROVEN

While the benefits of ADAS, like AEB, are clear, the same is not so for several partial automation technologies for both cars and trucks which are lacking independent supportive evidence or data. Moreover, several fatal crashes involving cars equipped with automated driving systems (ADS) or varying levels of driving automation have been subject to investigation by the NTSB and NHTSA.⁵⁰ These investigations have and will continue to identify safety deficiencies, determine contributing causes, and recommend government and industry actions to prevent future deadly incidents.

Advocates urges this Subcommittee to consider critical information from our nation’s preeminent crash investigators to inform any policies related to AVs. Further, since January 2018, NHTSA’s Office of Defects Investigation has identified at least eleven crashes in which a Tesla vehicle operating under its “Autopilot System” or Traffic Aware Cruise Control collided with vehicles at crash scenes where first responder vehicles lights and other control measures such as flares and cones were in place. This investigation must be a priority for NHTSA because of the serious safety implications associated with these troubling and recurring incidents. Findings from all these investigations should be publicly released and incorporated as applicable into any future legislation or regulation pertaining to AVs.

It is encouraging that NHTSA has recently taken several essential steps to address the substantial safety concerns associated with vehicles equipped with ADAS and ADS. Advocates supports NHTSA obtaining invaluable data involving vehicles equipped with Level 2 ADAS and ADS through Standing General Order 2021–01 (General Order) and the agency’s recent announcement that it intends to expand the General Order to include additional crashes including those involving VRUs.⁵¹ The agency indicates that it believes the frequency of crashes equipped with these systems will increase.⁵² The General Order will assist NHTSA in properly assessing the on-road performance and safety of these technologies. This unique information can help the agency identify common problems or systematic issues with certain vehicles and/or equipment.⁵³ Moreover, the reporting requirements of the General Order are properly tailored so that the agency can collect the appropriate data necessary as they are limited to crashes involving fatalities, injuries requiring transportation to a hospital, substantial damage to the vehicle, airbag deployment or an incident involving a vulnerable road user. The agency recently indicated that it has re-

⁴⁶ Campbell Robertson and Amanda Holpuch, Pittsburgh Bridge Collapses Hours Before Biden Infrastructure Visit, N.Y. Times (Jan. 28, 2022).

⁴⁷ David Schaper, 10 Years After Bridge Collapse, America Is Still Crumbling, National Public Radio (Aug. 1, 2017).

⁴⁸ 2021 Infrastructure Report Card—Bridges, American Society of Civil Engineers (ASCE); 2021 Infrastructure Report Card—Roads, ASCE.

⁴⁹ 2021 Infrastructure Report Card—Bridges (ASCE).

⁵⁰ The list of crashes and failures involving vehicles equipped with autonomous driving systems identified by Advocates is attached as Appendix B.

⁵¹ 86 FR 54287, 54288; 87 FR 4099 (Jan. 26, 2022).

⁵² *Id.*

⁵³ *Id.*

ceived four months of data from manufacturers.⁵⁴ During his nomination hearing before the Senate Committee on Commerce, Science, and Transportation in December 2021, Dr. Steven Cliff, nominee for NHTSA Administrator, affirmed the agency's intent to make the data public in the very near future.⁵⁵ We urge NHTSA to release all the data obtained from the General Order to the public in an understandable format as soon as possible.

The IIHS also has performed invaluable research on the Level 2 ADAS marketed as a convenience feature intended for highway driving for passenger motor vehicles. They have determined that if a manufacturer does place partial automation convenience systems in a vehicle, it should have essential safeguards to help prevent misuse that can result in dangerous situations such as failure to pay attention to the driving task.⁵⁶ These include driver monitoring systems to help ensure driver engagement with alerts to the driver that rapidly escalate in urgency and timing. In addition, emergency interventions such as slowing or stopping the vehicle are needed when driver disengagement with the driving task is detected, and the driver fails to respond appropriately. Additional safety protocols prohibiting a driver from using the system while unbuckled or when crash avoidance systems are disabled are critical. Consumer Reports (CR) has announced it will be awarding points for partially automated driving systems, but only if they have adequate driver monitoring systems.⁵⁷ This year IIHS expects to be issuing ratings on the performance of the safeguards that partial automation employs to help drivers stay focused on the roads including escalating alerts and appropriate emergency procedures.⁵⁸ CR plans to factor in the IIHS ratings once available.

ENSURING THE SAFE DEVELOPMENT OF AUTONOMOUS TECHNOLOGY

Development of AVs must be undertaken without jeopardizing public safety. The following commonsense safeguards are necessary to ensure those in and around AVs are protected. This also will help bolster consumer confidence in the technology.

Adoption of Basic AV Tenets Will Guarantee Safety and Public Acceptance

Advocates spearheaded the compilation of the "AV Tenets," policy positions which should be a foundational part of any AV policy.⁵⁹ This comprehensive approach is based on expert analysis, real world experience, and public opinion and is supported by 60 stakeholders representing safety, consumer, public health, labor, bicyclists, pedestrians, individuals with disabilities, smart growth, and others. It has four main, commonsense categories including: 1) prioritizing safety of all road users; 2) guaranteeing accessibility and equity for all individuals including those with disabilities; 3) preserving consumer and worker rights; and, 4) ensuring local control and sustainable transportation. Many promises have been touted about AVs bringing reductions in motor vehicle crashes and resultant deaths and injuries, lowering traffic congestion and vehicle emissions, expanding mobility and accessibility, improving efficiency, and creating more equitable transportation options and opportunities. As Secretary Buttigieg recently acknowledged, these outcomes are far from certain.⁶⁰ The AV Tenets will be necessary to help realize these goals as well as mitigate potential negative consequences. Among the numerous recommendations in the AV Tenets, requiring that AVs meet minimum standards, including for cybersecurity, and that operations are subject to adequate oversight, including a comprehensive database accessible by vehicle identification number (VIN) with basic safety information, will be critical to putting safety first with regards to this burgeoning technology.

Vigilant Oversight of Autonomous Commercial Motor Vehicles (ACMVs) is Essential

The emergence of experimental ACMVs and their interactions with conventional motor vehicles, trucks and buses and all road users for the foreseeable future demand an enhanced level of federal and state oversight to ensure public safety. It is imperative that CMVs, including those with ADS, be regulated by U.S. DOT with enforceable safety standards and subject to adequate oversight. The potential for an 80,000 pound truck equipped with unregulated and inadequately tested technology

⁵⁴ Jessica Wehrman, Highway safety nominee faces grilling over driverless vehicles, Roll Call (Dec. 16, 2021).

⁵⁵ Nominations Hearing, Before U.S. Senate Committee on Commerce, Science, and Transportation, 117 Cong (Dec. 16, 2021).

⁵⁶ IIHS, IIHS creates safeguard ratings for partial automation (Jan. 20, 2022).

⁵⁷ Keith Barry, Driver Monitoring Systems by Ford and GM Are Only Ones to Earn Points in CR's Tests, Consumer Reports (Jan. 20, 2022).

⁵⁸ IIHS, IIHS creates safeguard ratings for partial automation (Jan. 20, 2022).

⁵⁹ A summary of the AV Tenets is attached as Appendix C.

⁶⁰ Nilay Patel and Andrew J. Hawkins, Pete Buttigieg is Racing to Keep Up with Self Driving Cars. The Verge (Jan. 6, 2022).

on public roads is a very real and dangerous scenario if these vehicles are only subject to voluntary guidelines. In addition, automated passenger carrying CMVs which have the potential to carry as many as 53 passengers will need additional comprehensive federal rules specific to this mode of travel.

At a minimum, ACMVs must be subject to the following essential provisions:

- In the near term, rulemakings must be promulgated for elements of ACMVs that require performance standards including but not limited to the ADS, human machine interface, sensors, privacy, software and cybersecurity. ACMVs must also be subject to a “vision test” to guarantee they properly detect and respond to other vehicles, all people and objects in the operating environment. Also, a standard to ensure ACMVs do not go outside of their operational design domain (ODD) should be issued. Standards for ACMVs must be required to be issued by specific deadlines, with a compliance date, set by Congress before deployment.
- Drivers operating an ACMV must have an additional endorsement or equivalent certification on their commercial driver’s license (CDL) to ensure they have been properly trained to monitor and understand the ODD of the vehicle and, if need be, to operate an ACMV. This training must include a minimum number of hours of behind-the-wheel training.
- Each manufacturer of an ACMV must be required to submit a safety assessment report that details the safety performance of automated driving systems and automated vehicles. Manufacturers must be required to promptly report to NHTSA all crashes involving ACMVs causing fatalities, injuries and property damage.
- ACMVs that do not comply with Federal Motor Vehicle Safety Standards (FMVSS) must not be introduced into commerce nor be subject to large-scale exemptions from such.
- Any safety defect involving the ACMV must be remedied before the ACMV is permitted to return to operation. The potential for defects to infect an entire fleet of vehicles is heightened because of the connected nature of AV technology. Therefore, manufacturers must be required to promptly determine if a defect affects an entire fleet. Those defects which are fleet-wide must result in notice to all such owners and an immediate suspension of operation of the entire fleet until the defect is remedied.
- The U.S. DOT Secretary must be required to establish a database for ACMVs that includes such information as the vehicle’s identification number; manufacturer, make, model and trim information; the level of automation of each automated driving system with which the vehicle is equipped; the ODD of each automated driving system; and the FMVSS, if any, from which the vehicle has been exempted.
- For the foreseeable future, regardless of their level of automation, ACMVs must have an operator with a valid CDL in the vehicle at all times. Drivers will need to be alert to oversee not only the standard operations of the truck but also the ADS. Therefore, the Secretary must issue a mandatory safety standard for driver engagement. In addition, critical safety regulations administered by FMCSA such as those that apply to driver HOS, licensing requirements, entry level training and medical qualifications must not be weakened.
- Motor carriers using ACMVs must be required to apply for additional operating authority.
- FMCSA must consider the additional measures that will be needed to ensure that ACMVs respond to state and local law enforcement authorities and requirements, and what measures must be taken to properly evaluate an ACMV during roadside inspections. In particular, the safety impacts on passenger vehicle traffic of several large ACMVs platooning on bridges, roads and highways must be assessed.
- NHTSA must be given imminent hazard authority to protect against potentially widespread catastrophic defects with ACMVs, and criminal penalties to ensure manufacturers do not willfully and knowingly put defective ACMVs into the marketplace.
- NHTSA and FMCSA must be given additional resources, funding and personnel, in order to meet demands being placed on the agency due to the advent of AV technology.

Without these necessary safety protections, mandated by Congress to assure they are adopted with prescribed deadlines, commercial drivers and those with whom they share the road are at risk. Allowing technology to be deployed without rigorous testing, vigilant oversight, and comprehensive safety standards is a direct and unacceptable threat to the motoring public which is exacerbated by the sheer size and weights of large CMVs.

ACMVs Will Impact our Nation's Infrastructure

The Need for Improved Roadway Design: The design of our roads—from the asphalt, to the signage, to the lighting, to the speed limit—is largely based on the history of human performance behind the wheel and the capability of the vehicles. The introduction of AVs including ACMVs stands to essentially require a re-write of many of these guidelines for road design and use in the future. However, in the near term, there will need to be an evaluation of how standards for design can be enhanced to accommodate both human and machine “drivers.” Both human and machine “drivers” would benefit from improved lane marking as well as establishing standards for pavement resurfacing to ensure that repair seams and color differences do not confuse AV systems. Establishing uniform standards for signage color, lighting, contrast, letter size, and other roadway features will likely benefit the performance of AVs and will also reap similar advantages for human drivers in the interim. Many of the current manuals’ guidelines and recommendations are almost always open to engineering interpretation. With the advent of ACMVs, more emphasis must be placed on consistency, and consideration must be given to the effects variations can have on autonomous driving technology. While a human driver can see a unique situation and interpret those circumstances fairly well, an ACMV may not be able to do the same. Research has already shown that minor distortion of a sign can cause havoc for AVs, causing stop signs to be interpreted as speed limit signs, a confusion which can have serious, and potentially fatal, results.⁶¹ Clearly, new rules are required if ACMVs are allowed on our roadways.

Roadway deterioration and delayed repair, which are common occurrences on existing infrastructure, will have a negative impact on AV operation. In addition, how ACMVs utilize and navigate weigh stations, roadside inspections and truck stops must be considered. Every driver has experienced road signs or markings that have been damaged, intentionally altered or blocked by objects. This could lead to misinterpretation of roadway and highway cues and result in stopped or misdirected ACMVs that will present additional hazards. These findings and similar research illustrate that not only standards for roadway design can be critical to performance, but also that road design improvements alone may not suffice to ensure the safe operation of AVs. Combining standards for design with infrastructure improvements like vehicle-to-infrastructure (V2I) technology, backed by standards for such, would provide additional awareness for human drivers and unambiguous inputs for machine “drivers.”

Industry Hype v. Reality: The AV industry often has claimed that the introduction of these vehicles will reduce congestion, improve environmental quality, and advance transportation efficiency.⁶² However, many of these claims may amount to nothing more than aspirational goals. Instead, AVs may bring about so-called “hyper-commuters” who work from their vehicles on long commutes to enable living further from offices and/or city centers. Significant consideration must be given to how AV driving could change wear patterns on roadways. Heavy trucks already are accelerating the damage on our roads and highways. The lower variance of an AV’s, including ACMVs, position within a lane could lead to accelerated wear in lanes, and condensed convoys of automated trucks, commonly known as platooning, could place further strain on roads and bridges. All these concerns must be evaluated to consider operational constraints for AVs before further damage is inflicted upon our nation’s roads and bridges which are already weakened and in dire need of fortification and updating, as mentioned above. For example, the spacing between ACMVs in a platoon could have wide-ranging implications. If these large vehicles travel too closely together, their combined weight load could place severe stress on a bridge. In addition, lengthy platoons which consist of many ACMVs could be difficult to pass and affect merging and exiting from roadways.

Taking into consideration the long-term ramifications, the budgetary constraints, and the necessary coordination among a diverse group of stakeholders when it comes to planning and implementing infrastructure projects at any level, research is needed now more than ever on the impact of AVs on our roads. In addition, further research is also required to examine the differing infrastructure upgrades that will be required for urban, suburban and rural regions. More analysis and deliberation must be given to this complex issue before AVs, particularly ACMVs, can be deployed.

⁶¹Evtimov, Ivan & Eykholt, Kevin & Fernandes, Earle & Kohno, Tadayoshi & Li, Bo & Prakash, Atul & Rahmati, Amir & Song, Dawn. (2017). Robust Physical-World Attacks on Machine Learning Models.

⁶²Self-Driving Coalition For Safe Streets, FAQs.

Voluntary Agreements are Inadequate, Ineffective and Impossible to Enforce

To date, the approach of pursuing voluntary industry agreements, sometimes with government agency involvement, consistently has been demonstrated to be insufficient to ensure public safety. For example, the first edition of the AV Guidelines issued by U.S. DOT in 2016 encouraged the submission of voluntary safety self-assessment (VSSA) reports and the subsequent three editions have not altered this process.⁶³ Despite the fact that approximately 80 entities are testing AV technology,⁶⁴ just under 30 reports have been filed with U.S. DOT since the first voluntary guidelines were released in 2016.⁶⁵ Thus far, the U.S. DOT has failed to implement standard requirements for the information to be provided in the VSSA. Consequently, manufacturers are submitting incomplete, uninformative and sometimes outdated glossy, marketing-style brochures with little, if any, substantive or relevant information from which to ascertain critical and reliable information about safety and performance.

In September 2020, the U.S. DOT announced a new voluntary plan, the Automated Vehicle Transparency and Engagement for Safe Testing (AV TEST) Initiative.⁶⁶ It also focuses on the voluntary submission of information from AV manufacturers and operators, as well as state and local authorities. Similar to the VSSAs, the lack of a mandate and standard for submissions provides little if any value to assist in seriously evaluating or comparing the AV testing taking place across the country.⁶⁷ This initiative is an oversight mirage leaving all road consumers uninformed and at risk.

Another example of the ineffectiveness and failures of voluntary agreements is the March 2016 agreement among 20 automakers to install AEB in most new light vehicles as standard equipment by 2023. As of December 2021, two manufacturers, which account for nearly a third of the U.S. auto market, demonstrate this lackluster response to the detriment of public safety. Only 58 percent of General Motors vehicles and 43 percent of Fiat Chrysler vehicles were sold with AEB between September 1, 2020 through August 31, 2021. Moreover, the performance requirements in the agreement are exceptionally weak and consequently can result in these systems not performing as needed. This underscores the urgency for the U.S. DOT to issue a minimum performance standard for AEB in all new vehicles, and it undermines the public confidence in the potential of these promising safety systems to prevent death and injury on the highway.

The latest example of ineffectual voluntary agreements is the September 2019 announcement by the auto industry to equip cars with inadequate technology to prevent hot car deaths of children by 2025. Once again, this type of a pact unnecessarily prolongs the timeline to get equipment into new cars and fails to ensure the system meets a minimum performance standard.⁶⁸ In fact, General Motors announced it would equip its new cars with technology that “can detect motion as subtle as the breathing of an infant sleeping in a rear-facing child safety seat” in 2001 with the intent to begin rollout in 2004.⁶⁹ Yet, this technology was never installed. Meanwhile, children continue to needlessly die or tragically sustain serious injuries in hot cars. The IIJA took a step forward by directing the U.S. DOT to issue a rule on reminder technology within two years, but it is imperative that the final rule require the system *detect* the presence of an occupant in the entire passenger compartment. If not, ineffective systems, which are currently on the market, will give a false promise of preventing child deaths, but in reality not solve this tragic problem.

The common thread among all these voluntary initiatives is that at any time, any or all automakers can decide to no longer comply with the agreement or partially comply in whatever capacity they desire without any ramifications, underscoring the importance and benefit of regulatory action by U.S. DOT. They also allow auto manufacturers to continue upcharging, sometimes far in excess of the cost to the auto

⁶³U.S. DOT, Federal Automated Vehicles Policy (Sept. 2016); Automated Driving Systems: A Vision for Safety 2.0 (Sep. 12, 2017); Preparing for the Future of Transportation: Automated Vehicles 3.0 (Oct. 4, 2018); Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0 (Jan. 8, 2020).

⁶⁴Brookings Institution, Autonomous cars: Science, technology, and policy (Jul. 25, 2019).

⁶⁵NHTSA, Safety Self-Assessments, available at: <https://www.nhtsa.gov/automated-driving-systems/voluntary-safety-self-assessment>.

⁶⁶85 FR 39975 (Jul. 2, 2020).

⁶⁷Docket No.: NHTSA–2020–0070, Comment: NHTSA–2020–0070–0016 (Aug. 31, 2020).

⁶⁸Members of Congress, Safety Advocates and Grieving Parents Call for Technology Solutions to End Hot Car Tragedies as Fatalities Continue, Jul. 28, 2020, available at <https://conta.cc/30Sdt2w>.

⁶⁹General Motors News Release, “General Motors Announces Important New Technology to Help Save Children Trapped in Hot Cars,” (April 26, 2001).

manufacturers who benefit financially from keeping systems voluntary rather than mandatory.

Dispelling Misleading Claims about AVs

Some proponents of ACMVs claim that they will relieve supply chain issues by addressing the so called “driver shortage” within the trucking industry by eliminating the need for human drivers and allowing for the more efficient movement of goods through the constant operation of trucks. However, harsh and unsafe working conditions for interstate truck drivers have created a retention crisis, not a driver shortage. In fact, the U.S. Department of Labor has determined that “the labor market for truck drivers works about as well as the labor markets for other blue-collar occupations” and “a deeper look [at the truck industry labor market] does not find evidence of a secular shortage.”⁷⁰ According to industry data, driver turnover at some carriers is near 90 percent.⁷¹ In addition, states issue more than 450,000 new CDLs each year, demonstrating that there are candidates to fill vacancies.⁷²

The supply chain issues currently facing the nation are complex and will not be solved by the introduction of ACMVs, which will not be ready for prime time in the near future. This technology still faces significant operational challenges such as responding to all participants in the transportation ecosystem including traffic control officers and vulnerable road users as well as differing weather conditions. In fact, much of the testing of AVs is taking place in warm areas of the country that do not experience varied weather conditions including those that occur during treacherous winters. Moreover, the constant operation of trucks raises serious questions as to the ability to properly service vehicles continuously in use. Even without this potential new regime, 21 percent of CMVs were placed out of service in 2021 for maintenance issues.⁷³ In addition, many of the issues with the physical condition of the truck that would be identified by a human driver during a pre- or post-trip inspection as well problems during a trip such as the shift of a load or other emergencies noted by a human driver may not be identified or corrected under this type of use. Furthermore, adding an autonomous driving system into passenger carrying vehicles such as buses does not negate the need for a driver. Human interaction remains essential. Beyond the operational task, these professional drivers have a myriad of other responsibilities including assisting individuals with disabilities on and off the bus safely, managing emergency situations and the delivery of medical care, and coordinating safe transportation for all people.

Supporters of ACMVs also contend that placing autonomous systems in a CMV is not as daunting a task as with passenger vehicles because CMVs operate largely on highways, an easier environment for the technology to master. Operating a CMV on a congested highway at a high rate of speed is a complicated task in a dangerous environment as evidenced by the fact that a quarter of fatal crashes involving CMVs occur on highways.⁷⁴ Lastly, supporters of ACMVs also claim that the technology will eliminate most crashes citing a statistic accredited to NHTSA which indicates that 94 percent of crashes are due to human error or the fault of the driver.⁷⁵

However, the agency has noted in the same report which includes this data point that “[t]he critical reason is the immediate reason for the critical pre-crash event and is often the last failure in the causal chain of events leading up to the crash. Although the critical reason is an important part of the description of events leading up to the crash, *it is not intended to be interpreted as the cause of the crash nor as the assignment of the fault to the driver, vehicle, or environment*” (emphasis added).⁷⁶ This statistic was recently rebuked by NTSB Chair Jennifer Homendy who stated, “At the same time it relieves everybody else of responsibility they have for improving safety, including DOT . . . You can’t simultaneously say we’re focused on a ‘safe system’ approach—making sure everybody who shares responsibility for road safety is taking action to eliminate fatalities and serious injuries . . .—and have a

⁷⁰United States Department of Labor, Bureau of Labor Statistics, Is the U.S. labor market for truck drivers broken? (Mar. 2019).

⁷¹American Trucking Associations, Fourth Quarter Truck Driver Turnover Rate Shows Muddled Picture (Mar. 12, 2021).

⁷²Greg Rosalsky, Is There Really A Truck Driver Shortage?, National Public Radio (May 25, 2021).

⁷³FMCSA’s Motor Carrier Management Information System (MCMIS) data snapshot as of 12/31/2021. Available at: <https://ai.fmcsa.dot.gov/SafetyProgram/RoadsideInspections.aspx>

⁷⁴U.S. DOT, Large Truck and Bus Crash Facts 2019, Table 5, Report FMCSA–RRA–20–055 (Oct. 2021).

⁷⁵Singh, S. (2015, February). Critical reasons for crashes investigated in the National Motor Vehicle Crash Causation Survey. (Traffic Safety Facts Crash Stats. Report No. DOT HS 812 115). Washington, DC: National Highway Traffic Safety Administration.

⁷⁶*Id.*

94% number out there, which is not accurate.”⁷⁷ There are often multiple causes of a crash and replacing human error in the operation of a vehicle, when it does occur, with unproven technology is not a sensible solution to reducing the death toll on our nation’s roads. The fact remains that there is scant independently verifiable data that ACMVs can operate safely on any road or help to address any of the nation’s longstanding supply chain issues.

Some proponents of advancing the deployment of AVs contend the U.S. is at risk of falling behind other nations unless it takes steps to merely promote rather than regulate ACMVs. However, this fear-inducing claim is inaccurate. In fact, the United States is ranked fourth in the KPMG 2020 Autonomous Vehicles Readiness Index while Japan is ranked 11th, Germany is 14th and China is 20th.⁷⁸

Other countries in fact are taking a more calculated, careful and cautious approach.

- Germany requires a human to be behind the wheel of a driverless car in order to take back control and has other important elements including requirements for vehicle data recording.⁷⁹
- In the United Kingdom, testing has largely been limited to a handful of cities, and the government has proposed and published a detailed code of practice for testing AVs.⁸⁰
- In Canada, several provinces prohibit certain types of AVs from being sold to the public.⁸¹
- In Asia, Japan has allowed on-road testing with a driver behind the wheel and is currently working on regulatory and legal schemes for controlling the commercial introduction of AVs, but even so has not begun to address the highest levels of automation.⁸²
- In China, all AV operations remain experimental.⁸³

In sum, no country is selling fully automated vehicles to the public and by many accounts, none will be for a significant time in the future.⁸⁴ The U.S. is not behind other countries in allowing them to go to market, but we are behind in establishing and enforcing comprehensive safeguards to ensure that this process happens without jeopardizing or diminishing public safety. Congress can change this predicament by directing the U.S. DOT to issue minimum performance standards and exercise sufficient oversight.

CONCLUSION

Since our founding in 1989, Advocates has supported and worked to advance in federal legislation and government rulemaking the safe and equitable development and requirements for proven technologies to reduce crashes and save lives on our nation’s roads. AVs may, in the distant future, as many renown industry and public officials have explained, bring about meaningful societal benefits and improvements to public safety but it will require implementing and enforcing mandatory comprehensive safeguards to ensure AV technology is developed without putting the public at risk. Until the time that is demonstrated and supported by minimum government standards to ensure ongoing safe performance and reliability, adequate consumer information, and deterrents to industry transgressions, public officials should focus on requiring the installation of available, advanced safety technologies in all new vehicles and improving our compromised infrastructure to successfully mitigate and reduce the ongoing crisis of fatalities and injuries on our roads.

⁷⁷ Hope Yen and Tom Krisher, NTSB chief to fed agency: Stop using misleading statistics, Associated Press (Jan. 18, 2022).

⁷⁸ KPMG, 2020 Autonomous Vehicles Readiness Index.

⁷⁹ Dentons, Global Guide to Autonomous Vehicles 2020.

⁸⁰ *Id.*

⁸¹ *Id.*

⁸² Kyodo, JiJi, Cabinet paves way for self-driving vehicles on Japan’s roads next year with new rules, The Japan Times (Sep. 20, 2019).

⁸³ Dentons, Global Guide to Autonomous Vehicles 2020.

⁸⁴ Lawrence Ulrich, Driverless Still a Long Way From Humanless, N.Y. Times (Jun. 20, 2019); Level 5 possible but “way in the future”, says VW-Ford AV boss, Moring (Jun. 29, 2019).

VEHICLE SAFETY PROVISIONS IN THE INFRASTRUCTURE INVESTMENT AND JOBS ACT
(SENATE AMENDMENT TO H.R. 3684)

NOVEMBER 2021

- **Crash Avoidance Technology**
Steps Forward for Safety: Directs the U.S. Department of Transportation (DOT) to issue final rules on minimum performance standards and requirements for proven crash avoidance technologies including forward collision warning (FCW), automatic emergency braking (AEB), lane departure warning (LDW), and lane keeping assist (LKA) for all new passenger motor vehicles. Directs the U.S. DOT to issue a final rule within two years for AEB in new large trucks and requires the issuance of a Federal Motor Carrier Safety Regulation (FMCSR) to require drivers use AEB. Requires research two years after enactment on equipping medium sized commercial motor vehicles (CMVs) with the technology.
Safety Stalled: No date certain for rulemaking and compliance for crash avoidance technology for passenger vehicles. No compliance date for AEB requirement on large trucks. Fails to ensure crash avoidance technology will respond to pedestrians, bicyclists, and other vulnerable road users. Omits Class 3–6 trucks from AEB requirement despite the fact that some trucks are already equipped with them.
- **Impaired Driving Prevention Technology**
Steps Forward for Safety: Directs the U.S. DOT to issue a final rule within three years requiring passenger motor vehicles be equipped with impaired driving prevention technology, further provides for three years from issuance of the final rule for compliance and a potential three additional years at the discretion of the Secretary.
Safety Stalled: Opens the door to potential delay in rulemaking by allowing a report to Congress if a final rule isn't issued within ten years of enactment. The systems must be set at .08 percent blood alcohol concentration (BAC), as opposed to state legal limits which may be lower.
- **Vehicular Heatstroke (Hot Cars) Prevention Technology**
Steps Forward for Safety: Directs the U.S. DOT to issue a final rule within two years requiring all new passenger motor vehicles weighing less than 10,000 pounds to be equipped with a system to alert the operator to check rear-designated seating positions after the vehicle engine or motor is deactivated by the operator. Provides an additional two years for compliance.
Safety Stalled: Fails to require hot cars prevention technology that *detects* the presence of unattended children who may have entered independently or been left intentionally or unintentionally. The alert system is limited only to the rear seat although children have died or been injured in the front seat area.
- **Distracted Driving**
Steps Forward for Safety: Directs the U.S. DOT to conduct research on driver monitoring systems within three years and report to Congress. The Secretary then must determine if one or more rulemakings is required. Adds new grant opportunity for states that ban distracted viewing. Improves transparency in grant determination process.
Safety Stalled: No date certain for rulemaking and compliance for distracted driving prevention systems.
- **Seat Back Standard**
Steps Forward for Safety: Directs the U.S. DOT to issue an Advanced Notice of Proposed Rulemaking (ANPRM) on whether to improve the seat back safety standard within two years of enactment. If the Secretary decides to issue a final rule, requires compliance within two years of issuance of the rule.
Safety Stalled: The Secretary has complete discretion for action. If s/he determines an update is needed, only requires an ANPRM, not a final rule. Therefore, there is no actual requirement that the seat back standard be updated.
- **Headlamps**
Steps Forward for Safety: Directs the U.S. DOT to issue a final rule updating the headlamp standard (Federal Motor Vehicle Safety Standard (FMVSS) 108) and permitting adaptive headlamps within two years.
Safety Stalled: No compliance date for improvements to headlamps.

- Hood and Bumper Standards

Steps Forward for Safety: Directs the U.S. DOT to issue a notice for review and comment as well as a report on potential updates to hood and bumper standards within two years of enactment.

Safety Stalled: No date certain for rulemaking and compliance for hood and bumper updates.
- Keyless Ignitions

Steps Forward for Safety: Directs the U.S. DOT to issue a final rule within two years to mandate an automatic shutoff for vehicles with keyless ignition and combustion engines within a period as determined by the Secretary which, absent good cause to delay implementation, takes effect one year after final rule. The U.S. DOT is further directed to conduct a study on vehicle rollaways.

Safety Stalled: Does not adequately address risks associated with keyless ignitions by failing to require a rulemaking on rollaway.
- U.S. New Car Assessment Program (NCAP)

Steps Forward for Safety: Directs the U.S. DOT to complete the update of NCAP that was initiated in 2015 as well as publish a notice for public comment on consumer information on advanced crash avoidance technologies and vulnerable road user safety within one year. Requires U.S. DOT to issue a “roadmap” every four years on plans to update U.S. NCAP to keep pace with vehicle technology, subject to public comment and annual stakeholder engagement.

Safety Stalled: Fails to ensure U.S. NCAP is comprehensively updated and addresses the safety of vulnerable road users.
- Consumer Protections

Steps Forward for Safety: Establishes a grant program for states to inform consumers of vehicle safety recalls within two years of enactment. Requires original equipment manufacturers (OEMs) to report to the National Highway Traffic Safety Administration (NHTSA) on recall completion rates as well as directs the Government Accountability Office (GAO) to conduct studies related to recalls within two years of enactment. Requires U.S. DOT to conduct a study within 18 months to evaluate Early Warning Reporting (EWR) data and identify any improvements to enhance safety and report to Congress describing results including any recommendations for regulatory or legislative action.

Safety Stalled: Fails to include deadline for U.S. DOT action to update EWR data.
- Underride Protection

Steps Forward for Safety: Directs the U.S. DOT to update the rear guard standard to meet the Insurance Institute for Highway Safety (IIHS) crash protocols and be subject to annual inspection, as well as research side underride guards. Establishes an advisory committee on underride protection.

Safety Stalled: Does not require side and front underride guards.
- Limousine Safety

Steps Forward for Safety: Requires limousines to be equipped with safety belts and be subject to standards for seat strength and integrity. Directs the U.S. DOT to conduct research on FMVSS for side impact protection, roof crush resistance, and air bag systems within four years of enactment, followed by rulemaking within two years of completion of the research. Requires U.S. DOT to conduct research on evacuation, followed by rulemaking within two years of completion of the research. Requires consumer information on most recent inspection to be prominently disclosed including on the website of the operator.
- School Bus Safety

Steps Forward for Safety: Directs the U.S. DOT to review laws, safety measures, and technologies relating to school buses.

Safety Stalled: Does not require vital improvements to school bus safety including requirements for seat belts, automatic emergency braking, fire suppression, and to curb school bus driver fatigue.
- Funding Provisions

Steps Forward for Safety: Includes several provisions to enhance public roadway safety such as an incentive grant for a Safe System approach to roadway design and building to minimize conflicts between road users, especially between vehicles and vulnerable road users, to prevent fatalities. Allows federal funding to be used for automated enforcement systems in work and school zones. Improves transparency in determinations for the highway safety grant

program awards to states to help combat dangerous behaviors such as impaired and distracted driving.

Safety Stalled: Other changes to highway safety grant program requirements for distracted driving may weaken incentivization for state action to upgrade their traffic safety law.

Steps Backward for Safety—

- *Teen Truck Drivers:* Permits teen and young drivers under age 21 to drive in interstate commerce through a three-year pilot apprentice program that permits 3,000 participants at a time—amounting to potentially more than 25,000 per year. Requires U.S. DOT to report to Congress on data collected during the pilot program and conduct a driver compensation study.
- *Hours of Service (HOS) for Truck Drivers:* Provides HOS exemption for livestock haulers within 150 air miles of the destination (current law already allows for such exemption within 150 air miles of the source). Requires U.S. DOT to analyze cost and effectiveness of electronic logging devices (ELDs) which have already been shown to reduce driver violations of HOS rules, as well as report on processes used by the Federal Motor Carrier Safety Administration (FMCSA) to review logs and allow carriers to challenge violations relating to an ELD.
- *Truck Size and Weight:* Permits overweight trucks, which disproportionately damage infrastructure and threaten public safety, to operate on certain roadways in Kentucky, North Carolina and Oklahoma. Allows these states to retain operational laws that exceed federal weight limits after these roads become part of Interstate System.

APPENDIX B

CRASHES AND FAILURES INVOLVING VEHICLES EQUIPPED WITH AUTONOMOUS DRIVING SYSTEMS: PUBLIC ROADS SERVING AS PROVING GROUNDS AND ENDANGERING ALL ROAD USERS

August 28, 2021, Orlando, FL, Tesla Model 3: A Tesla crashed into a parked police car and a Mercedes SUV. The patrol car's emergency lights were flashing, and the Tesla driver told police that "autopilot" was engaged at the time of the crash. The National Highway Traffic Safety Administration (NHTSA) is investigating the crash.



Photo Source: Florida Highway Patrol

May 15, 2021, Lake Stevens, WA, Tesla Model S: A Tesla ran into a Sheriff's patrol SUV that was parked on the side of a road with emergency lights flashing responding to previous crash. "Autopilot" was reportedly engaged at the time of the crash.



Photo Source: Snohomish County Sheriff's Office

May 5, 2021, Fontana CA, Tesla Model 3: A Tesla struck a previously overturned truck which was blocking two lanes on the highway. According to the California Highway Patrol, "Autopilot" was engaged at the time of the crash. The National Highway Traffic Safety Administration (NHTSA) is investigating the crash.



Photo Source: New York Daily News

April 17, 2021, The Woodlands, TX, Tesla Model S: A Tesla travelling at a "high rate of speed" around a curve went off the road about 100 feet and hit a tree. NHTSA and the National Transportation Safety Board (NTSB) are investigating the crash.



Photo Source: Reuters

March 17, 2021, Eaton County, MI, Tesla Model Y: A Tesla ran into a state patrol car parked on the side of the highway. The patrol car had emergency lights activated at the time. Michigan State Police said the driver was using “Autopilot” at the time of the crash. NHTSA is investigating.



Photo Source: Michigan State Police

August 26, 2020, Zebulon, NC, Tesla Model S: A Tesla ran into a police cruiser parked on the side of the highway, causing the cruiser to collide with a state trooper's vehicle. According to media reports, police said the driver was watching a movie on his phone and that “Autopilot” was engaged when the crash happened.



Photo Source: WRAL-TV

December 29, 2019, Cloverdale, IN, Tesla Model 3: A Tesla collided with a firetruck killing the passenger in the Tesla. The use of “Autopilot” has not been determined. NHTSA is investigating.



Photo Source: Indiana State Police

December 29, 2019, Gardena, CA, Tesla Model S: A Tesla ran a red light and struck another vehicle killing the two occupants in the other vehicle. The use of “Autopilot” has not been determined. NHTSA is investigating.



Photo Source: Loudlabs

December 7, 2019, Norwalk, CT, Tesla Model 3: A Tesla slammed into a parked police cruiser and another vehicle. Media reports that the “Autopilot” was engaged at the time of the crash. NHTSA is investigating.



Photo Source: Connecticut State Police

March 1, 2019, Delray Beach, FL, Tesla Model 3: The driver was killed when his vehicle, operating on “Autopilot,” crashed into the side of a truck tractor combination, traveling underneath the trailer. (NTSB Investigation HWY19FH008, brief completed)



Photo Source: NTSB

May 29, 2018, Laguna Beach, CA, Tesla Model S: A Tesla reportedly on “Autopilot” crashed into a parked Laguna Beach Police Department Vehicle. The driver suffered minor injuries.



Photo Source: LA Times

March 23, 2018, Mountain View, CA, Tesla Model X: While on “Autopilot”, a Tesla struck a safety barrier, causing the death of the driver. (NTSB Investigation HWY18FH011, report completed)



Photo Source: Forbes

March 18, 2018, Tempe, AZ, Uber Self-Driving Test Vehicle: The Uber vehicle, which was operating on “self-driving mode,” struck and killed a pedestrian walking a bicycle. (NTSB Investigation HWY18MH010, report completed)



Photo Source: NBC News

January 22, 2018, Culver City, CA, Tesla Model S: A Tesla, reportedly on “Autopilot,” was traveling at 65mph when it crashed into the back of a parked firetruck that was responding to the scene of a separate crash. (NTSB Investigation HWY18FH004, brief issued)



Photo Source: Culver City Firefighters

November 8, 2017, Las Vegas, NV, Driverless Shuttle Bus: A driverless shuttle bus was involved in a crash during its first day of service. There were no deaths or injuries. (NTSB Investigation HWY18FH001, brief issued)



Photo Source: Fox5 Vegas

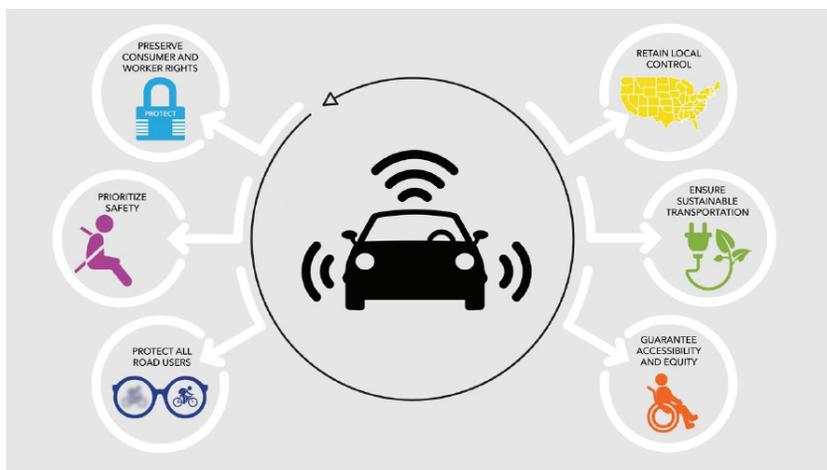
May 7, 2016, Williston, FL, Tesla Model S: The driver was killed when his vehicle, operating on “Autopilot,” crashed into the side of a truck tractor combination, traveling underneath the trailer. (NTSB Investigation HWY16FH018, report completed)



Photo Source: NTSB

INTRODUCTION TO AUTONOMOUS VEHICLE (AV) TENETS
BY ADVOCATES FOR HIGHWAY AND AUTO SAFETY

NOVEMBER 30, 2020



In 2019, more than 36,000 people were killed and millions more were injured in motor vehicle crashes. The National Highway Traffic Safety Administration (NHTSA) currently values each life lost in a crash at \$9.6 million. Annually crashes impose a financial toll of over \$800 billion in total costs to society and \$242 billion in direct economic costs, equivalent to a “crash tax” of \$784 on every American. Additionally, crashes cost employers \$47.4 billion in direct crash-related expenses annually, based on 2013 data (Network of Employers for Traffic Safety (NETS)).

Many promises have been made about autonomous vehicles (AVs) bringing meaningful and lasting reductions in motor vehicle crashes and resulting deaths and injuries, traffic congestion and vehicle emissions. Additionally, claims have been made that AVs will expand mobility and accessibility, improve efficiency, and create more equitable transportation options and opportunities. However, these potentials remain far from a near-term certainty or reality. Without commonsense safeguards the possibilities are imperiled at best and could be doomed at worst. Additionally, the absence of protections could result in adverse effects including safety risks for all people and vehicles on and around the roads, job displacement, degradation of current mobility options, infrastructure and environmental problems, marginalization of certain users, and others. Requiring that AVs meet minimum standards and that operations are subject to adequate oversight throughout development and deployment will save lives as well as costs for both the consumer and the manufacturer.

Moreover, on the path to AVs, proven solutions are currently available that can prevent or mitigate the exorbitant death and injury toll now while laying the foundation for AVs in the future. Available vehicle technologies, also known as advanced driver assistance systems (ADAS), should be standard equipment with minimum performance standards. Research performed by the Insurance Institute for Highway Safety (IIHS) has found that these systems can help to prevent and lessen the severity of crashes. For example, IIHS has determined that automatic emergency braking (AEB) can decrease front-to-rear crashes with injuries by 56 percent. In addition, the National Transportation Safety Board (NTSB) has included increasing implementation of collision avoidance technologies in its Most Wanted Lists of Transportation Safety Improvements since 2016.

It is a transformational time in transportation history. Yet, Benjamin Franklin’s infamous quote from 1736, “An ounce of prevention is worth a pound of cure,” aptly applies. We urge our Nation’s leaders to use this document as the “GPS,” the way to “guarantee public safety,” as AV development and deployment moves forward.

SUMMARY OF TENETS OF AUTONOMOUS VEHICLE (AV) LEGISLATION¹

PRIORITIZING SAFETY OF ALL ROAD USERS

Safety Rulemakings: All levels of automated vehicles² must be subject to comprehensive and strong federal standards ensuring they are safe and save lives. The rulemakings must address known and foreseeable safety issues, many of which have been identified by the National Transportation Safety Board (NTSB) and others, including:

- *Revising Federal Motor Vehicle Safety Standards:* Any actions by the National Highway Traffic Safety Administration (NHTSA, Agency) to revise or repeal existing Federal Motor Vehicle Safety Standards (FMVSS) must be through a public rulemaking. Any revision must meet the safety need provided by current standards.
- *Collision Avoidance Systems:* Certain advanced safety technologies, which may be foundational technologies for AVs, already have proven to be effective at preventing and mitigating crashes across all on-road modes of transportation and must be standard equipment with federal minimum performance requirements. These include automatic emergency braking with pedestrian and cyclist detection, lane departure warning, and blind spot warning, among others.
- *“Vision Test” for AVs:* AVs must be subject to a “vision test” to guarantee it will operate on all roads and weather conditions as well as properly detect and respond to all vehicles, people and objects in the operating environment.
- *Human-Machine Interface (HMI) for Driver Engagement:* AVs must provide adequate alerts to capture the attention of the human driver with sufficient time to respond and assume the dynamic driving task for any level of vehicle automation that may require human intervention.
- *Cybersecurity Standard:* Vehicles must be subject to cybersecurity requirements to prevent hacking and to ensure mitigation and remediation of cybersecurity events.
- *Electronics and Software Safety Standard:* Vehicles must be subject to minimum performance requirements for the vehicle electronics and software that power and operate vehicle safety and driving automation systems individually and as interdependent components.
- *Operational Design Domain (ODD):* The NHTSA must issue federal standards to ensure safeguards for driving automation systems to limit their operation to the ODD in which they are capable of functioning safely.
- *Functional Safety Standard:* Requires a manufacturer to ensure the design, development, verification and validation of safety-related electronics or software demonstrates to NHTSA that an AV will perform reliably and safely under the conditions the vehicle is designed to encounter.
- *Safe Fallback:* Every driving automation system must be able to detect a malfunction, degraded state, or operation outside of ODD and safely transition to a condition which reduces the risk of a crash or physical injury.
- *Crash Procedures Standard:* Requires manufacturers to have procedures in place for when an AV is involved in a crash to ensure the safety of all occupants of the AV, other road users and emergency responders.
- *Standard for Over-the-Air (OTA) Updates:* Requires consumers be given timely and appropriate information on the details of the OTA update and ensures any needed training or tutorials are provided.

Safety and Performance Data: With the increasing number of vehicles with different automated technologies being tested and some being sold to the public, standardized data elements, recording, and access to safety event data are necessary for the proper oversight and analysis of the performance of the driving automation systems. Safety and performance data should be made available to relevant stakeholders with appropriate privacy protections.

Manufacturer Submissions to NHTSA: Any submission to NHTSA by AV manufacturers or developers must be mandatory, publicly available and include thorough and adequate data and documentation. Additionally, NHTSA must be directed to review and evaluate all submissions to assess whether an approach to automated driv-

¹These tenets are limited to vehicles with a gross vehicle weight rating (GVWR) of 10,000 pounds or less unless otherwise noted; however, it is imperative that automated delivery vehicles (including those used on sidewalks and other non-roadways) and commercial motor vehicles be subject to comprehensive regulations, including rules regarding the presence of a licensed, qualified driver behind the wheel.

²Partially automated vehicles (SAE International Level 2) and conditional/highly automated vehicles (SAE International Levels 3, 4, 5).

ing system (ADS) development and testing includes appropriate safeguards for operation on public roads.

Proper Oversight of Testing: AV testing is already underway in many localities. Fundamental and commonsense safeguards must be instituted for testing on public roads including the establishment of independent institutional review boards (IRBs) to certify the safety of the protocols and procedures for testing of AVs on public roads.

Additional Resources and Enforcement Authorities for NHTSA: Ensuring NHTSA has adequate resources, funds, staff, and enforcement authority is essential for the Agency to successfully carry out its statutory mission and address the multiple challenges presented by the testing and deployment of self-driving technologies.

GUARANTEEING ACCESSIBILITY FOR ALL

Access for Individuals with Disabilities and Older Adults: Autonomous driving technology has the potential to increase access and mobility for everyone including older adults and individuals with disabilities, including those with sensory, cognitive, and physical disabilities, wheelchair users, and people with neurological conditions, who have varying needs as well as traditionally underserved communities. This goal must be realized with appropriate federal action.

Access for Underbanked Populations: Access to on-demand transport services is often predicated on the ability to make digital payments. AV-based transport services must consider a variety of ways in which payment for service can be made to ensure that this technology supports equitable access and the inclusion of all.

Equity: As new modes of transportation continue to grow and evolve, investment and development must include a process where all people can safely participate.

Accessibility, Passenger Safety, and Transportation Services: There must be clear plans to ensure the safe transportation for all people, in particular for those who currently require assistance to do so or are part of marginalized communities, in the implementation of these transportation services.

PRESERVING CONSUMER AND WORKER RIGHTS

Consumer Information: Consumer information regarding AVs should be available at the point of sale, in the owner's manual, and in any OTA updates. The vehicle identification number (VIN) should be updated to reflect whether certain features were built into the vehicle, either as standard or optional equipment. NHTSA must establish a website accessible by VIN with basic safety information about the AV level, safety exemptions, and limitations and capabilities of the AV.

Privacy: All manufacturers of passenger motor vehicles, including AVs, should be required to comply with robust data privacy safeguards and policies. The ability of NHTSA, the NTSB, and local law enforcement to access critical safety performance data, while preserving the integrity of personal, private or identifying data, in a timely manner for research, crash investigation and other governmental purposes must be preserved.

Workforce Protections: Absent strong leadership, AV technology risks worsening severe inequalities already inherent in our society, predominantly for blue collar workers. Existing and foreseeable issues which stand to be greatly exacerbated by this technology must be addressed before this technology is broadly deployed on our roads. Similarly, unforeseeable issues throughout deployment will need to be resolved with input from stakeholders.

Whistleblower Protections: Employees or contractors who want to report safety defects to NHTSA should not be prevented from doing so as the result of a non-disclosure agreement (NDA).

*Consumer and Worker Rights*³: The well-established rights of consumers to seek accountability in a court of law for injuries suffered as a result of AVs must be preserved. Moreover, exploitative independent contractor relationships that shield AV companies from liability and deny workers basic workplace rights should be explicitly prevented.

³Advocates for Highway and Auto Safety does not take a position on this issue.

ENSURING LOCAL CONTROL AND SUSTAINABLE TRANSPORTATION

Local, State and Federal Regulatory Roles: In keeping with existing law and practice, the federal government should prescribe regulations for the performance of these vehicles, leaving regulation of the operation of these vehicles to the states.

In-Depth Study of AV Impacts on Transportation Systems and Environment: DOT must undertake a comprehensive study to inform policymakers and the public about how these vehicles will impact our existing transportation systems and ensure effective mitigation of problems identified.

NOTE: The AV Tenets outlined in this document do not constitute the entirety of each supporting organization's policy priorities related to AVs.

Ms. NORTON. Thank you very much, Ms. Chase.

Before our next witness provides testimony, I would like to recognize Representative Lamb to say a few words of introduction about the next witness.

Mr. LAMB. Thank you, Madam Chair. I am excited to introduce my constituent, Nat Beuse, who lives here, in the 17th Congressional District of Pennsylvania, and works for Aurora.

One sentence about Aurora: They are an incredible, far-seeing company that is going to be with us for a long time, coming from executives and innovators out of Uber and Tesla and Waymo. They have partnered with companies like Toyota and Volvo to really take the lead in self-driving and automation technology, both for cars and trucking. You can see their cars on the road in the city of Pittsburgh almost any time, and they really have been an honor to have in our community as one of their main headquarters.

Nat is the vice president of safety, 1 of 900 Aurora employees that we have in western Pennsylvania. He leads the development of their approach to safety every single day. He works with groups on industry standards and regulatory bodies to offer guidance about how we are going to make rules for this industry of the future. He was with Uber before Aurora, but, probably most relevant for us, before working in the private sector, Nat oversaw the entire Nation's motor vehicle safety research program, including automated vehicles, as the Associate Administrator for Vehicle Safety Research at NHTSA. He also serves on the board of Mothers Against Drunk Driving.

So, this is somebody coming to us today who not only has significant industry experience and can help us understand the day-to-day, but has worked on behalf of the entire public before, and still continues some of that work in the——

[Audio malfunction.]

Ms. NORTON. Thank you very much.

Mr. Beuse, you are recognized.

Mr. BEUSE. Good morning, Chair DeFazio, Chair Norton, Ranking Member Graves, Ranking Member Davis, and members of the subcommittee. My name is Nat Beuse, and I am the vice president of safety at Aurora. Thank you for the invitation to testify before you today on the subject of autonomous vehicle technology, and thank you to Representative Lamb for the very kind introduction.

Aurora's mission is to deliver the benefits of self-driving technology safely, quickly, and broadly. We are building the Aurora Driver: the hardware, software, and data services that can be used to power any vehicle to move people or goods safely. Aurora was founded in 2017 by experts in the AV field: Chris Urmson, Sterling

Anderson, and Drew Bagnell. And the company has grown to over 1,600 employees across 8 offices in 7 States, including Pennsylvania, California, Montana, Texas, Washington, Colorado, and Michigan.

I lead the team responsible for developing and implementing Aurora's holistic approach to safety. Our programs cover all aspects of our operations, organization, and the engineering of our product. We also work with industry standards groups, regulatory bodies to develop best practices and safety standards, and to share our safety approach because transparency is critical for the success of this technology.

My entire professional career has been focused on making our roads safer. It is a deeply personal connection for me and for so many Americans. It is not acceptable that we lose 40,000 Americans every year, and that millions are injured in crashes.

The unbelievable part is this trend has been going on in the wrong direction for far too long. NHTSA released new data yesterday showing that traffic fatalities continue to rise at a record pace. I believe deeply in the work that we do at Aurora every day, and that it is going to be a part of the solution to improve safety on our roads.

First, it is important to note for this subcommittee that Aurora is a regulated company at all levels of Government. Our technology is subject to NHTSA's motor vehicle safety requirements, and our motor carrier operations are subject to FMCSA's safety regulations.

In addition, each State in which we operate has its own approach to permitting and regulating our AV operations. While USDOT's jurisdictions over AV is clear and in full force, there are several open rulemakings about the safe deployment of AVs that we would like to see move forward as we continue to build our internal safety programs in parallel.

So, where does my role as VP of safety at Aurora fit into this regulatory system?

There is one thing we know from decades of learning across safety-critical industries: failures in safety are rarely caused by a single person, but instead by organizations that fail to prevent multiple mistakes from turning into a disaster. At Aurora, we are building on these lessons.

Two of our strategies for our approach are as follows: one, all of our employees are empowered to request halting of operations if they believe there is a safety concern, and this is part of our larger approach for managing safety risks. Teams across Aurora are held responsible for completing our safety case framework, providing evidence that our AVs are acceptably safe to operate on public roads.

How we develop the Aurora Driver and prepare for public road operations also matters. An incredible amount of work goes into mapping a route, collecting real-world data for our virtual testing suite, and strategically using on-road testing to validate our simulations. With our virtual testing suite, Aurora runs millions of simulations every day. This allows us to train and evaluate the Aurora Driver software across a vast range of scenarios well before that software is loaded onto vehicles or onto public roads.

We do not build technology for its own sake, or as a silver bullet. We are building the Aurora Driver to improve safety and support our partners. A key example is our pilot with FedEx. We are running commercial loads today for FedEx on I-45 between Dallas and Houston while in autonomy. This pilot is critical for us to learn, while testing safely on public roads.

In my remaining time, I will highlight two ways Aurora believes Congress and USDOT can support the safe development of AVs.

First, we ask Congress and the administration to ensure that laws and regulations for AVs are technology and business-model neutral.

Second, we ask Congress to ensure that any commissioned research about the job-related impacts of AVs be driven by actual industry experience with the technology, and that job quality be central to any policy and industry conversation.

Aurora is committed to continuing to tackle these important issues together with Congress, USDOT, our State regulators, cities, law enforcement, safety advocates, labor, and many other stakeholders to support safety, innovation, and jobs here in the United States.

I want to thank Ms. Tatum and Mr. Marler for their leadership on AV issues in their communities and their testimony today.

Chairman DeFazio, thank you for your work on AV trucking issues this past Congress. The process you led demonstrates how impactful leadership from Congress can be.

Thank you again for the opportunity to testify today, and I look forward to your questions.

[Mr. Beuse's prepared statement follows:]

Prepared Statement of Nat Beuse, Vice President of Safety, Aurora

Chair DeFazio, Chair Norton, Ranking Member Graves, Ranking Member Davis, and Members of the Subcommittee on Highways and Transit. Thank you for the invitation to provide testimony for the hearing "The Road Ahead for Automated Vehicles."

My name is Nat Beuse and I am the Vice President of Safety at Aurora. Aurora's mission is to deliver the benefits of self-driving technology safely, quickly, and broadly. We are building the Aurora Driver: a platform that brings together software, hardware, and data services, to autonomously operate any vehicle without the need for a human operator in the vehicle. Aurora has offices across 8 cities in 7 states, including our headquarters in Pittsburgh, Pennsylvania, and employs 1,600 employees ranging from hardware and software engineers to commercial drivers and operations specialists.

At Aurora, I lead the team developing and implementing Aurora's rigorous and comprehensive approach to safety. We oversee operational, organizational, and product engineering safety, and work with industry standards groups and regulatory bodies to offer guidance and to define and support the development of best practices and safety standards. Prior to Aurora, I led the safety team at Uber Advanced Technologies Group (ATG) where I further developed their approach to safety. Before working in the private sector, I spent nearly twenty years serving the American public in several capacities including leading the New Car Assessment Program, serving as Director for the Office of Crash Avoidance Standards, and finally as Associate Administrator for the Office of Vehicle Safety Research at the National Highway Traffic Safety Administration (NHTSA). In that last role, I oversaw the nation's motor vehicle safety research program, including automated vehicles and cybersecurity. Today, I also serve on the board of two roadway safety advocacy non-profit organizations, Mothers Against Drunk Driving and Lifesavers, and live in Pittsburgh with my family.

ABOUT AURORA

Aurora is delivering the benefits of self-driving technology safely, quickly, and broadly. Founded in 2017 by experts in the autonomous vehicle (AV) industry, Chris Urmson, Sterling Anderson, and Drew Bagnell, Aurora is revolutionizing transportation—making it safer, increasingly accessible, and more reliable and efficient than ever before. Our flagship product, the Aurora Driver, is a platform that brings together software, hardware, and data services, to autonomously operate passenger vehicles, light commercial vehicles, and heavy-duty trucks. Aurora is partnered with industry leaders across the transportation ecosystem including Toyota, Uber, Volvo Trucks, FedEx, and PACCAR. Aurora tests its vehicles in the Bay Area, Pittsburgh, and Texas, and has offices in those areas as well as in Bozeman, Montana; Seattle, Washington; Louisville, Colorado; and Wixom, Michigan.



We have a diverse and talented team with a multitude of backgrounds and perspectives, focused on creating a transformative business for the long-term and realizing our mission. We also leverage expertise from external groups including our Industry Advisory Council¹ and Safety Advisory Board².

Our goal at Aurora is to transform transportation—to make it more democratic, more productive, more dependable, and—crucially—much safer than it is today. The teams we create, the work that we do, and the partnerships we build all serve this mission: To deliver the benefits of self-driving technology safely, quickly, and broadly.

We see incredible opportunities for the Aurora Driver to positively impact transportation. We can save lives while also increasing safety and efficiency on our roads. We can make the movement of people and goods both less expensive and more accessible. We can serve communities and industries in mutually beneficial and transformative ways.

However, unlike other types of vehicle technologies, delivering the full potential of all these opportunities depends on one concept: trust. Our technology needs to be trustworthy. Our company and our engineering work need to be trustworthy. And so our task is to build trust, one step at a time, by making safety the foundation of everything we do from the beginning.

BUILDING SAFETY FOR SCALE

Safety is at the core of everything we do at Aurora. It shapes who we hire, how we work, and how we develop our products. Everyone at Aurora is empowered to speak up and say something when they see something. We've also built layers of redundancies into every part of the Aurora Driver. We collaborate regularly with

¹Aurora, "Introducing the Aurora Industry Advisory Council," <https://aurora.tech/blog/introducing-the-aurora-industry-advisory-council>.

²Aurora, "Our Updated Safety Report and First-Ever Safety Advisory Board," <https://aurora.tech/blog/aurora-shares-safety-report>.

the industry to develop industry best practices and voluntary standards, and we openly share our progress in the communities where we are operating. We hold ourselves to rigorous internal safety standards that cover our engineering, operations, and organization.

It is worth noting how far the industry has come in the last decade in the development of standards for AVs. In 2017, USDOT published AV 2.0, which lists exactly 3 standards (SAE J3016, ISO 26262, and MIL-STD-882E) that should be considered by automated driving system (ADS) developers. Fast forward to 2021, and USDOT's comprehensive plan lists 20 different standards that ADS developers should consider. And based on Aurora's involvement in industry standards development, we know there are over a dozen more standards and best practices currently under development across the various standards organizations.

I am pleased to share just a few examples of where we have developed industry leading approaches to safety that have been openly shared with our fellow industry partners, the public, regulators, and other safety stakeholders.

Managing Safety Risks

As we like to say at Aurora, "Safety is a team sport." We take a holistic view of safety, focusing on creating a strong safety culture that permeates every part of our company, including how we do business. A key part of that approach to safety is implementing our own Safety Management System, commonly referred to as SMS. This is an organizational approach—employed by safety-critical industries like aviation, maritime shipping, and rail—that standardizes how safety is managed at a company. SMS is a rigorous, internationally accepted framework that is mandated for other modes of transportation and provides a reproducible and auditable record of safety management within a company. SMS starts at the top, with our CEO being our Accountable Executive for the safety of operations, instilling safety into every aspect of the company.

A SMS ensures that safety information is presented to the right person, at the right time, and that there is accountability and transparency for every safety action taken across the company. This approach ensures that safety is prioritized as we make decisions, with features such as a Safety Review Board for safety risk management decisions and a clear and easy-to-use Safety Concern Reporting process for all employees. It also enables us to measure our safety performance over time to work for constant improvement in our policies, processes, systems, and controls.

At Aurora, we are building our SMS on four key components—a detailed Safety Risk Management structure, a robust Safety Assurance program, disciplined Safety Policy documentation, and an engaging Safety Culture that includes safety education and events. Our SMS helps us proactively identify safety issues, resolve them as early as possible, and institutionalize the learning for future application. It also ensures our entire company values safety, understands our safety procedures, uses a common language to talk about risk, and is appropriately empowered to take action on safety.

Safety Advisory Board

Building a team with depth and breadth of safety expertise is a key part of our safety approach. Inside Aurora, we have multi-disciplinary experts with decades of experience in autonomous and automotive safety. And to ensure we're always testing our assumptions and raising our safety standards, we also leverage the expertise of safety leaders outside of Aurora. We created the Safety Advisory Board to gain hundreds of years' collective experience in safety, offering the company an external perspective on Aurora's overall approach to safety, as well as other broader industry topics, like how we engage with regulators and the public. The Board also offers feedback on systematically managing, controlling, and mitigating safety risks.

This Board is made of experts from fields including aviation safety, insurance, emergency/trauma medicine, automotive safety, and academia:

- Shailen Bhatt, Senior Vice President for Global Transportation Innovation, AECOM
- Dave Carbaugh, Former Chief Pilot Flight Operations, The Boeing Company
- Dr. Adrian Lund, Managing Member of HITCH42, LLC and former President of the Insurance Institute for Highway Safety
- Dr. Victoria Chibuogu Nneji, Lead Engineer & Innovation Strategist at Edge Case Research

- Karen Rasmussen, Executive Director of the Independent Carrier Safety Association (ICSA)³
- Dr. Jeff Runge, President of Biologue, Inc. and former Administrator of the National Highway Traffic Safety Administration
- George Snyder, President and CEO of GHS Aviation Group

Safety Case Framework

How do we know if an AV is safe enough to drive on public roads? It's a question that has been asked since society first started talking about the potential for AVs to grace our roads. At Aurora, we are using a safety case-based approach, a defined way to evaluate when our vehicles are acceptably safe to operate on public roads and to assess that they are not creating an unreasonable risk to roadway safety.

In August 2021, we publicly released Aurora's Safety Case Framework—the first AV Safety Case Framework that applies to both autonomous trucks and passenger vehicles. We believe that a Safety Case Framework is the most effective and efficient path to safely removing the vehicle operator and it is an imperative component for any company looking to operate without a vehicle operator and safely deliver commercial-ready AVs at scale. The Aurora Safety Case Framework assesses the entire development lifecycle of our vehicles, allowing us to accelerate our path to deployment and determine when AVs are acceptably safe for public roads. We are the only AV company currently operating in our industry to publicly share its Safety Case Framework.

We believe the only viable way to validate that an AV is safe enough to drive on the road is to develop a structured argument, using a framework of claims and the evidence to support those claims. Building a Safety Case Framework allows us to demonstrate exactly how we are approaching safety and the many factors we are taking into consideration—a stark contrast to simply reporting on miles driven or disengagements, which do not necessarily provide support for the fact that a vehicle is safe for any specific context or environment. This structured approach is the only way Aurora believes we can safely commercialize our AVs.

No single piece of evidence captures the totality of safety. There are complex interactions and relationships between the many elements that go into an AV. Ultimately, evidence without a claim is simply trivia and, conversely, a claim without evidence is baseless. A safety case-based approach brings these two essential concepts together in a logical manner to effectively show the work that we are doing to determine our vehicles are safe to operate on public roads. Along with delivering a safe product, being transparent with our approach is an important part of developing autonomous technology.

Our top-level claim, that the Aurora Driver is acceptably safe to operate on public roads, is broken down into the following five safety principles:

- Proficient
 - Fail-safe
 - Continuously improving
 - Resilient
 - Trustworthy
1. Proficient—An AV cannot be considered safe to operate on public roads unless it is suitably proficient. Proficiency includes the design, engineering, and testing necessary to develop a product. This safety principle contains the engineering requirements for nominal operations and performance.
 2. Fail-Safe—The fail-safe principle addresses how the AV behaves in the presence of faults and failures. No system is ever 100% perfect; components will wear out or have premature failures from time to time. The Aurora Driver is designed to detect and safely mitigate these failures. This safety principle contains the fault detection, mitigation, and notifications built into the vehicle to ensure that in the event of a fault or failure, the Aurora Driver will behave in an acceptably safe manner.
 3. Continuously Improving—The continuously improving principle outlines how we are enshrining the concept of continual improvement into the development of our system. An AV is equipped with sensors, and a fleet of AVs captures significant amounts of data from just a single day's operations. We are able to harness the power of this data to enable continuous improvement. This field data feeds a comprehensive data analysis effort that calculates safety performance indicators and also considers data collected during design and development. This approach to systematically collect and analyze data allows us to

³“Aurora Welcomes Trucking and Freight Expert to Company's Safety Advisory Board,” Business Wire, <https://www.businesswire.com/news/home/20211015005433/en/Aurora-Welcomes-Trucking-and-Freight-Expert-to-Company%E2%80%99s-Safety-Advisory-Board>.

spot trends, regressions from the mean, and emergent behaviors. Aurora also takes a proactive approach to continuous improvement, using risk identification techniques to proactively identify and manage risks.

4. Resilient—AVs are designed to safely operate on public roads, but this does not isolate them from malicious actors or unavoidable events. The resilient principle showcases how the Aurora Driver is capable of withstanding adverse events and intentional misuse and abuse.
5. Trustworthy—Aurora’s AV may be Proficient, Fail-Safe, Continuously Improving, and Resilient, but without the trust of the public and governmental regulators, we cannot fully realize our top level claim. The trustworthy safety principle addresses how Aurora plans to gain trust through public, government, and stakeholder engagement, safety transparency, safety culture, as well as external review and advisory activities.

Aurora’s self-driving vehicles are acceptably safe to operate on public roads[®]



THE AURORA DRIVER & PARTNERSHIPS

In 2021 alone, we partnered with one of the largest transportation and logistics companies in the world with FedEx, the number one ride hailing platform on the planet with Uber, the number one global vehicle OEM with Toyota, and two of the top three North American OEM’s in trucking with Volvo and PACCAR.

We showed how the Aurora Driver can be seamlessly integrated into freight operations via an industry-first collaboration with FedEx and PACCAR. Through this pilot, Aurora-powered PACCAR trucks are regularly and autonomously hauling FedEx loads in Texas between Dallas and Houston—a 500-mile round trip, currently with a trained vehicle operator and co-pilot in the cab gathering data on the Aurora Driver’s performance.⁴ We believe this collaboration demonstrates the value of autonomous technology as the economy faces a supply chain crisis, making the need for dynamic logistics solutions more important than ever.

After partnering with Volvo last March, we developed the trucking leader’s first-ever prototype truck for autonomous commercial, hub-to-hub freight operations in North America—the Aurora-powered Volvo VNL. As Volvo’s flagship long-haul model, and the first vehicle in Volvo’s fleet to be designed from the ground up to operate with the Aurora Driver, this represents a significant step toward building and deploying autonomous commercial Level 4 Class 8 trucks at scale for Volvo Autonomous Solutions customers in North America.

⁴See “Aurora Illuminated: Aurora Driver Hyperlapse on Texas Roads,” Sept. 2021, <https://www.youtube.com/watch?v=ttvEppD3Pjk>.



FEDERAL POLICIES TO SUPPORT THE DEVELOPMENT OF SAFE AVS

Aurora takes safety to heart—it is not just a principle for us. It is how we are building a safety culture and process for a future where our families can travel safer in and around vehicles powered by the Aurora Driver. It is unacceptable that we lose over 40,000 people in the United States each year in vehicle crashes, and yet, we are on track for one of the worst years for roadway safety in decades. We are committed to being part of the solution.

There are tremendous opportunities for the whole federal government to continue supporting the development of AV technology here in the United States to provide certainty that companies, including Aurora, need to continue investing and building here.⁵ Creating a level playing field where the rules are clear and conducive to realizing the benefits for safety, mobility, and efficiency for AV technology is a necessary role of government.

First, Aurora supports the work of Members of this Committee, Congress, and USDOT to ensure that laws and regulations for AVs are performance-based and technology and business-model neutral.

Second, federal leadership supporting the development of AV technology here in the United States is critical. The work that started many years ago at USDOT under Secretary Foxx, continued under Secretary Chao, and carries through today under Secretary Buttigieg. USDOT's guidance, research and rulemakings that have been initiated specific to AVs, along with the Department's use of its convening authority to bring stakeholders together, has laid the foundation for the future. We would like to thank Secretary Buttigieg for raising important safety issues in his six guiding principles for transportation innovation and in the "Comprehensive National Roadway Strategy." We also believe USDOT should be considering the full suite of potential solutions, including AVs, to address the rise in highway fatalities.

We support NHTSA's efforts to modernize the Federal Motor Vehicle Safety Standards (FMVSS) and the Federal Motor Carrier Safety Administration's (FMCSA) efforts to modernize the Federal Motor Carrier Safety Regulations (FMCSR) to encourage the development of new and innovative AV technologies.

As you know, the FMVSS and FMCSR were not created with autonomous technology in mind. As such, neither currently contemplate the integration of autonomous technology, like the Aurora Driver, into vehicles, and should be updated to account for this new technology as appropriate to improve the efficiency of the technology's deployment. There are important open rulemakings at NHTSA and FMCSA that need to continue to expeditiously move forward.⁶ In preparation for other future regulatory actions, the agencies should continue providing guidance, conducting

⁵ See "Forefront: Securing Pittsburgh's Break-out Position in Autonomous Mobile Systems," Sept. 2021, <https://ridc.org/news/autonomy-study/>.

⁶ See, e.g., NHTSA, Framework for Automated Driving Systems Safety, RIN 2127-AM15; NHTSA, Occupant Protection for Automated Driving Systems, RIN 2127-AM06; and FMCSA, Safe Integration of Automated Driving Systems-Equipped Motor Vehicles, RIN 2126-AC17.

research, and fostering collaboration among stakeholders to support AV development. Additionally, the existing exemptions process at NHTSA should be used as a bridge to get real-world data to USDOT about innovative vehicle technologies.

Third, we believe Congress should pass legislation confirming the federal government maintains its regulatory authority over the design, construction, and performance of AVs. Every vehicle that is on public roads, including AVs, is subject to the Motor Vehicle Safety Act, which provides NHTSA with broad authority over the safety of motor vehicles and motor vehicle equipment and to issue and update regulations as necessary for the purpose of reducing traffic crashes. States can, and should, continue to regulate the testing and deployment of AVs on their roads in areas such as on-road operations, titling, licensing, test driver training, and the like. Many states have proactively passed legislation on these issues, which support the development of AVs. Still, there is tremendous value in leadership from the federal government supporting the AV industry and the safety, economic, and mobility benefits of this technology.

As an example, we believe the federal government has the opportunity to provide leadership encouraging uniformity of existing state rules of the road. For example, in some jurisdictions it is required by law to use a bike lane to make a right-hand turn while in others it is prohibited. We do not have a position on what is the safest option, but we do believe that uniformity across states would be beneficial for all road users, including the Aurora Driver. Similarly, we see vastly different autonomous operational permitting requirements across state jurisdictions, with some states allowing operations with few permitting requirements and others instituting significant testing parameters or even outright prohibiting autonomous testing or operation. Such differences in programs slow down the nationwide rollout of this technology. While autonomous operations permitting and traffic law are clearly within state jurisdiction, Congress could provide valuable guidance to states and NHTSA on tackling this patchwork of laws that affects all drivers, regardless of whether they are human or autonomous.

Fourth, Aurora supports maintaining the self-certification process for vehicles in the United States and believes a Safety Case-based argument supported by evidence is the way for companies to make safety determinations as discussed above.

Fifth, we ask Congress to ensure that commissioned research about the job-related impacts of AVs be driven by actual industry experience, and that job quality should be central to any policy and industry conversation. It is encouraging that a USDOT report from last year indicated that potential reductions in long-haul trucking jobs related to AVs are likely to be offset by natural occupational turnover instead of layoffs.⁷ Testing and deploying AV technology is a key component of ensuring there are real world models to ground these important conversations as we continue to learn more about new and transitioning jobs.

Finally, transparency is key to building trust with all stakeholders. I am here before the Subcommittee to introduce Aurora and to explain what we are building and how we have safety integrated into every part of the organization. We would like to thank this Committee, and Chairman DeFazio in particular, for his work with industry and labor on the provisions regarding AV trucks in his infrastructure bill considered earlier this Congress. The process demonstrated how leadership from Congress can drive positive outcomes.

We will continue to encourage NHTSA to reach out to industry as it is developing AV-related policies and guidance. When appropriate, we will take the opportunity to comment on the record and suggest concrete improvements to those policies. For example, the difference between driver assistance systems and the autonomous system we are building is critical for the public to understand. The language and definitions NHTSA uses in regulations, orders, and guidance will drive the public discourse and needs to be clear for all stakeholders. We will continue investing in an elevated public discourse on these topics. For example, Aurora is a founding member of PAVE, the Partnership for Automated Vehicle Education, because of how important we believe engagement and education is for all stakeholders.

CONCLUSION

Transparency and collaboration are key to our progress and future at Aurora. We are committed to continuing to work with the Subcommittee as it addresses these important issues and supports safety, innovation, and jobs across the United States. Thank you for the opportunity to provide this testimony and answer the Subcommittee's questions.

⁷ "Macroeconomic Impacts of Automated Driving Systems in Long-Haul Trucking," Jan. 28, 2021, FWHA-JPO-21-847, <https://rosap.nhtl.bts.gov/view/dot/54596>.

Ms. NORTON. Thank you very much, Mr. Beuse.

We go next to Mr. Bloch, who is the political director of the Teamsters Joint Council 7.

Mr. BLOCH. Thank you, Chair Norton, Ranking Member Davis, Chairman DeFazio, and members of the subcommittee. I appreciate the opportunity to testify before you today.

My name is Doug Bloch, and I am the political director for Teamsters Joint Council 7, and I am proudly representing over 100,000 Teamsters in northern California and Nevada.

A future that includes partial and fully autonomous vehicles will change the nature of work in nearly every part of the transportation industry. Congress will play a key role in determining whether these changes will be for the better or worse. And in this case, I am afraid that, if we let large corporations write the rules themselves, then it will surely be the latter.

Our union is not afraid of new technologies. The Teamsters logo displays a team of horses, and in our early days there were skeptics who thought that horses would never be replaced with motorized transportation. But the technology evolved, and so did we. We can do it again, but we need your help.

The impact that AVs will have on workers is still unknown. Congress has an opportunity to mitigate these impacts before they happen, and possibly shape better outcomes. Our experience makes me skeptical about claims that we will train our way out of any job losses. We once had roughly 100,000 members working in California canneries, and, thanks mostly to automation, we are down to about 15,000 now.

When the Campbell Soup Company shut their Sacramento cannery and 700 Teamsters lost their jobs, Government swooped in to provide job training assistance. Later, the paper reported on a second-generation Teamster from Campbell. Her mom worked there for 40 years. As a single mom herself, she made \$23 an hour, plus benefits. After the closure, it took her 3 years to learn to become an ultrasound technician and find a job.

This is a place where Government can step in. This committee was right to include the Surface Transportation Workforce Retraining Grant Program in the Invest in America Act. The act also mandated that transit agencies receiving grants to deploy AVs must require workforce development plans from applicants.

We are trying to get ahead of the curve here. How do we capture the jobs being created by automation and make sure they are good union jobs?

What can our elected officials do to help?

We are meeting with manufacturers and Government to see how to do that. In San Francisco, we represent nearly 1,500 workers in parking garages. AV fleets need a place to park, get charged, be maintained. This is work the Teamsters already do in parking garages and for rental car agencies. There is no reason why municipal garages cannot be retooled to serve AV fleets, and Teamsters should be doing that work.

However, every time there is a hearing like this, companies call us up. And while we have many good conversations, so far it hasn't resulted in many new union jobs. That is why it is critical that

Government does not cede the ability to regulate these new technologies and industries.

It is also important to ask, what is the problem we are trying to solve here?

One problem we hear a lot about recently is the so-called truck-driver shortage. Before deregulation in the 1980s, driving a truck was a good middle-class job. But in very little time, trucking devolved to one where misclassified independent contractor drivers work an average of over 60 hours a week, in many cases making less than minimum wage.

Automation is industry's answer to a driver retention problem that industry itself created. The solution is not to do away with humans, but to better enforce our labor laws and bring back good jobs.

Finally, the issues facing commercial vehicles are different and potentially more dangerous than personal. They warrant their own separate and careful consideration. Every day our members see both the benefits of new technologies and the malfunctions that occur. Human drivers are a much-needed safety net for those scenarios and more.

The commercial use of vehicles at 10,000 pounds or less presents an agency jurisdictional issue which should be addressed. For example, Waymo recently teamed up with our employer, UPS in Arizona, to use self-driving vans. And Nuro received California's first AV deployment permit. These are under 10,000 pounds, but they are clearly operating as commercial vehicles.

The committee included the Operation of Small Commercial Vehicles Study in the Invest Act. We urge you to continue to explore this segment of the package delivery industry for appropriate regulation.

In closing, in all aspects of automation, but especially when we are considering commercial motor vehicles, it is important to get it done correctly, rather than just done quickly. We applaud you for having this hearing with the Teamsters voice at the table. Thank you, and I look forward to answering any questions you may have.

[Mr. Bloch's prepared statement follows:]

**Prepared Statement of Doug Bloch, Political Director, Joint Council 7,
International Brotherhood of Teamsters**

Chair Norton, Ranking Member Davis, Chairman DeFazio and Members of the Subcommittee, thank you for the opportunity to testify before you today on "The Road Ahead for Automated Vehicles" a subject that is of vital importance to America's transportation workers and the traveling public.

INTRODUCTION

My name is Doug Bloch. I am the Political Coordinator for Teamsters Joint Council 7 in San Francisco. The Joint Council represents over 100,000 Teamster members in Northern California, the Central Valley and Nevada. The Teamsters Union is the nation's largest transportation union, representing workers in almost every transportation industry. Teamster members could be delivering anything from bakery goods to ready mix concrete, palletized material to your latest online-ordered package—or getting you to work on time and safely transporting your kids to school.

While nearly 600,000 of our 1.4 million members turn a key in a truck to start their workday, the issues we will be discussing today don't just impact those who drive vehicles for a living. A future that includes partial and fully autonomous vehi-

cles could also change the nature of work for those in nearly every part of the transportation industry in our country. Congress will play a key role in determining whether these changes will be viewed by millions of Americans as something that is occurring for the better, or for the worse. In the case of self-driving vehicles, I'm afraid that if we let large corporations write the rules themselves, unchecked, then it will surely be the latter.

Planning for the future and incorporating new technologies into our members' daily lives is not new to me or to my Union. Our Teamsters Union logo to this day proudly displays a team of horses, which was how our membership delivered goods in the early 1900's. Back then there were skeptics who thought that horses would never be replaced with motorized transportation, but the technology evolved, the workforce evolved, and the union adjusted to that change, just as we will with automated vehicles. But we will need your help to do so. It is the Federal government's responsibility to set the regulatory floor for AVs, but state and local government should not be preempted from adopting more stringent regulations. And, state and local entities must have the authority to revoke operational authority in response to accidents or incidents with malfunctioning technology that put the public in danger.

Congress must ensure that workers are trained for the new jobs that AV technology will bring and that highway and vehicle safety standards are maintained as automated vehicles are developed, tested, and deployed on our highways. Extensive data collection and reporting must be a mandate, as should the opportunity for human intervention in commercial AV use. And manufacturers must be required to cooperate with investigating agencies in the event of crashes and/or fatalities. These are all part of the *Labor Principals for Autonomous Vehicle Legislation*¹ that the Teamsters Union and the 34 unions comprising the Transportation Trades Department (AFL-CIO) have developed to address the issues that self-driving technology will introduce on our roads and in the workplace.

DATA COLLECTION AND REPORTING

Truck drivers, bus drivers and thousands of other frontline transportation workers will be sharing the road with AVs for years to come. In California, testing for truck platooning is already permitted with a driver in the vehicle. Testing for passenger cars, smaller package delivery vehicles, and delivery bots are authorized, automated shuttles are being tested and are coming to airports and other locations.

The performance of AVs will be of paramount importance to the safety of our members, not only for those who operate on the roads, but for those who work directly with those vehicles in other roles, such as performing maintenance or loading and unloading the vehicle. All workers deserve to know that an autonomous vehicle or bot traveling next to them is safe enough to share the same road or worksite. To that end, it is imperative that transparency exists in the development and testing of AVs. Extensive data collection and reporting by manufacturers is key to driving good policy and eventual promulgation of regulations in this AV space and must be required. Manufacturers and operators need to collect and report crash, injury and fatality data, much of what is required now under various state and federal laws, but also data relating to malfunctions, disengagements and interventions will better inform both regulators and the public about the safe operation of these vehicles. The more regulators know about human interface with technology in testing and development the better they will be equipped to ensure the safe operation of AVs.

Analysis of crash data is often essential in preventing further accidents from occurring. We've all seen the value of the black box in the airline industry in helping determine crash causation. Automated vehicles should be no different than any other transportation system user. Investigating agencies must be able to obtain a recorder or recorded information relating to an accident involving an AV. Therefore, it is incumbent on this committee to ensure that agencies like the NTSB and NHTSA have the clear authority to compel companies to provide post-accident information. AVs cannot be an exception.

The Teamsters Union strongly supports the *Tenets of Autonomous Vehicle (AV) Legislation*² developed by the Advocates for Highway and Auto Safety and endorsed currently by over sixty stakeholders. While these tenets apply to vehicles with a gross vehicle weight rating (GVWR) of 10,000 pounds or less, much of the framework that Congress is developing for vehicles 10,000 lbs. and under will inform the work that this committee does in developing the regulatory framework for Auto-

¹ <https://ttd.org/policy/letters-to-congress/labor-principles-for-autonomous-vehicle-legislation/>

² <https://saferoads.org/wp-content/uploads/2020/11/AV-Tenets-11-24-20-1.pdf>

mated Commercial Motor Vehicles (CMVs) greater than 10,000 pounds. Current voluntary initiatives for AVs must be replaced by DOT rulemaking on safety standards with time limits for issuance of final rules and compliance dates.

WORKFORCE PROTECTIONS

The United Parcel Service (UPS) is the Teamsters largest employer. It's the single largest collective bargaining agreement in the country, covering over 250,000 workers. Amazon is UPS' largest customer. Amazon has patented a highway network that controls self-driving trucks and cars and is developing an app to match them with shipments from their distribution centers. They are also testing drones for deliveries and automating their warehouses. The impact that AVs will have on workers is not yet fully known. But attempting to tackle these issues after the fact is not acceptable. Congress has a unique opportunity to mitigate these impacts before they happen.

The Teamsters once had roughly 100,000 members working in the California canneries. For generations of families, especially Latino families, these jobs were the path to the middle class. Thanks mostly to automation, we now represent just 15,000 members in canneries. In 2012, when Campbell's Soup shut their Sacramento plant and 700 Teamsters lost their jobs, the government swooped in to provide job training assistance. In 2016, the Sacramento Bee reported on a second-generation Teamster from Campbell's. Her mom worked there for 40 years. As a single mom herself with two kids she made \$23 an hour plus benefits. After the closure, she received job training assistance. It took her three years to learn to become an ultrasound technician and find a job. She was forced to move her family in with her mom and struggled to cover costs when she had health issues. In the meantime, Campbell Soup's owner, who is a member of the 17th wealthiest family in the country, gave up his US Citizenship and moved to Ireland to avoid US taxes. This is where government comes in. We can't trust the companies to write the rules. We need commitments from them to retain and retrain incumbent workers. We need them to work with us to create strong programs for workers to learn the new skills and jobs—and those programs need to be directly linked to employment. And we need to make sure these are quality jobs. That is where the real innovation can happen. We can use technology to augment jobs and make them safer instead of just automating them. We can ensure that workers profit from technology, not just the companies that are developing it or purchasing it.

This committee took a step in the right direction when it included the Surface Transportation Workforce Retraining Grant Program (Section 5305) in the Invest in America Act. This provision establishes a workforce retraining grant program for surface transportation workers whose jobs have been or will be affected by automation. The program would award grants to eligible entities to test new roles for existing jobs, to develop degree or certification-granting programs, and for direct worker training or train-the-trainer programs. Grants to transit agencies that deploy AVs providing public transportation (Section 2603 of the IAA) must require workforce development plans. This program and this requirement should serve as a model for mitigating job losses, wage degradation and allocating retraining funds for displaced workers.

It is also incumbent on Congress to ensure that as the AV industry grows in this country that it be made in America by American workers.

AUTOMATED COMMERCIAL VEHICLES

The issues facing autonomous commercial vehicles are fundamentally different, and potentially more dangerous than those facing passenger cars, and warrant their own careful consideration. The consequences for getting this wrong could be deadly both for workers and other drivers on the roads. The public discussion in Congress on autonomous vehicles has tended to focus on the impact of small personal cars on our daily lives—increasing mobility for the disabled, providing transportation access to the underserved, and alleviating congestion in our cities. These are all important topics. But taking a cookie cutter approach in dealing with those issues and applying it to large heavy vehicles could be very dangerous.

Regardless of the technology, automated heavy trucks will still have maneuverability issues including longer stopping distances, and their crash impact on smaller vehicles, occupants and pedestrians will still be devastating. Human intervention must remain as a necessary safety component to take over control of commercial AVs when technology fails. Alertness and reaction times are different for one who is actively performing a driving task than for a driver who may be disengaged from driving during autonomous operation of a commercial AV. So, the proper alerts must be incorporated to give the driver the time to react, re-engage and take control

of the vehicle in the event of technology malfunction. In the case of an automated commercial vehicle, a human driver/operator should be in the vehicle regardless of the level of automation. And a level of training for the driver, perhaps with a specific AV endorsement for the CDL, should be mandated, so that only those trained on the AV technology can assume control of the vehicle when that technology fails to operate properly. This committee will have to give thought to how hours-of-service for drivers will affect the ability of automated commercial vehicles to operate over long stretches of time. Airline pilots who rely on auto-pilot technology are subject to hours-of-service in the cockpit, as are locomotive engineers who rely on positive train control. It should be no different for 18-wheel truck drivers in the cab and other drivers of automated commercial vehicles. This committee conducted extensive hearings on the failed automation of the Boeing 737-MAX and the consequences of relying exclusively on technology. Human oversight and intervention, when necessary, will ensure the safe deployment of autonomous vehicles. If commercial AVs are monitored remotely, it will be important to establish a remote monitor/operator to vehicle ratio that ensures that a monitor can react quickly to technology malfunctions/failures, mitigate the situation and position the AV in a safety zone. That ratio should be 1:1 for large commercial vehicles.

It is interesting to note that most testing of self-driving trucks is occurring in states like Arizona, California, and Texas, where weather conditions are mild for the most part. And it's no coincidence that Texas passed a law in 2018 that essentially gave autonomous vehicles the same status as conventional vehicles. Inclement weather, including blinding rain and snow, dense fog, and hazardous road conditions can present challenges to sensors, cameras, and radars that AVs rely on to operate safely. Advocates' *Tenets* calls for a "Vision Test" for driverless cars which should also be a requirement for commercial automated vehicles. They must be proven to be able to operate on all roads and in all weather conditions, detecting all vehicles, people and objects in their path. While our members have experienced the benefits of technology that some motor carriers have implemented, like lane departure warnings and collision avoidance systems, we know firsthand that malfunctions have occurred. For example, our Teamster members have experienced problems with automatic emergency braking systems in snowy conditions. Drivers are a much-needed safety net for these unknown factors.

The Committee has been forward-thinking about automated commercial vehicles and initiated several provisions in its Invest in America Act that the Teamsters Union supports and are worth noting. Unfortunately, some were ultimately absent from the Senate version enacted into law. One such provision, Section 5308 of the INVEST Act, would require entities operating automated CMVs in interstate commerce to report data to a repository, including the type of vehicle, level of automation, DOT number, where operation of the vehicle occurs and miles traveled, in addition to documenting training of drivers, fatigue management plans, law enforcement interaction plans and proof of insurance. While the public has access to the repository, identity of the specific entity reporting the data to DOT is shielded. The committee should revisit this restriction when it considers commercial AV legislation.

The current commercial use of vehicles with a GVWR of 10,000 pounds or less presents a agency jurisdictional issue which should also be addressed. Waymo recently teamed up with UPS in Arizona to use Waymo self-driving Chrysler Pacifica vans to pick up packages at UPS Stores and deliver them to a sorting center in Phoenix. And Nuro, which built a small self-driving package delivery vehicle, received California's first autonomous vehicle deployment permit in 2020. These are under 10,000 lb. AVs, but they are clearly operating as commercial vehicles. The Committee included Section 4104, Operation of Small Commercial Vehicles Study, in the INVEST Act, which would examine the safe operation of this class of vehicle. We would suggest that small commercial AVs fit within the parameters of this study, and the Committee should continue to explore this segment of the package delivery industry for appropriate regulation of these vehicles, including delivery bots.

DRIVER RETENTION AND MISCLASSIFICATION

It's important to ask what the problem is that we are trying to solve with AV technology? We hear about the benefits of lower emissions, cost savings, and supposedly safer highways. The other big problem we have heard a lot about in recent months is the so-called shortage of available drivers. The Teamsters know why it is difficult to attract and retain drivers in non-union truck driving jobs. Prior to the deregulation of trucking by the federal government in the 80s, driving a truck was a good middle-class job. After deregulation, a new model emerged of hiring truck

drivers as independent contractors instead of employees. The independent contractor model allows trucking companies and their customers to outsource almost all the costs and risks of trucking onto the backs of the workers. Independent contractors are treated as small businesses under the law and as such they have no legal right to organize a union. In very little time, trucking went from a good job to one where drivers work an average of over 60 hours a week, much of it unpaid and away from home, and in many cases making less than minimum wage. Workers have no health insurance, unemployment, worker's comp, or social security.

This situation has only been exacerbated by recent supply chain congestion. Misclassified drivers can wait for hours on end for a single haul with no compensation for their time in queue. A 2019 Bureau of Labor Statistics report found a 94% turnover rate in large Truckload Carriers and nearly 80% in smaller Truckload Carriers, using data collected by the American Trucking Association. The ATA even estimates an annualized turnover rate for truckload drivers at large motor carriers at 92 percent in the fourth quarter of 2020. Such astronomically high turnover rates point to a problem with working conditions. Intentional misclassification is the cause of those poor working conditions. It is also one of the factors contributing to the congestion crisis at the ports. The problem is not a lack of drivers willing to do the job, but rather a system plagued by structural inefficiencies. To rationalize this system, we must first rein in misclassification with all the policy tools at our disposal, starting with vigorous enforcement. Automation is industry's answer to a driver retention problem that industry itself created. The solution to the harmful consequences and negative impact of intentional misclassification and the subsequent degradation of good middle-class jobs is not to just do away with the workers.

For all the discussion here about the potential benefits that may accompany this AV technology, I urge you to consider these possibilities with a healthy dose of realism. When you hear manufacturers tell you that a list of strong safety metrics will translate into effortless deployment on the roads, this will not happen without proper Congressional oversight, regulatory guidelines, and a good amount of transparency by the companies as they test and deploy these vehicles on our roadways.

Self-driving vehicles have the potential to change the transportation industry as we know it. That can be for the better or for the worse depending on the actions that this committee, workers, and others take in guiding their implementation onto our roads. It is incumbent upon the members of this committee to help ensure that workers are not left behind in this process, and it is essential that American workers are not exposed to unproven technologies that could put their lives at risk. The Teamsters have strived to balance the incorporation of countless pieces of new technology into the workplace while ensuring that workers are guaranteed a right to avoid harassment and to always feel safe on the job. New technologies can co-exist in an environment where workers are given the opportunity to up-skill and fill those jobs of the future. In the trucking space where margins are consistently tight and competition is fierce, the fear of many transportation workers is that absent strong action and guidance from this committee and others, a new generation of autonomous vehicles will provide limitless opportunity for disruption and displacement of the transportation workforce. Could workers see their jobs reclassified and their paychecks reduced because half of their job has now been automated away and their employer thinks that it can get away with no longer paying them the full wage they once did?

There are so many impacts for this committee to consider as you move forward with legislation. Issues such as worker harassment and tracking would be intertwined with existing collective bargaining agreements and workplace policies, along with whistleblower protections. Cybersecurity standards should prevent a truck driver from having to think about his rig being hacked and used as the next weapon in a terrorist attack.

We applaud you for having this hearing with the Teamsters' voice at the table. We look forward to working with the Committee to ensure that the priorities and concerns of working families remain at the center of this debate. In all aspects of automation, but especially when we are considering commercial motor vehicles, it is more important to get it done correctly rather than just done quickly.

Thank you and I look forward to answering any questions you may have.

Ms. NORTON. Thank you, Mr. Bloch, for your testimony.

I would like to recognize now the chair, Mr. DeFazio, for his introduction of the next witness.

Mr. DEFAZIO. Thank you, Madam Chair. I am pleased to introduce the next witness, Professor Nico Larco at the University of Oregon School of Architecture and Environment.

Professor Larco is the director of the Urbanism Next Center, which focuses on how technological advancements such as AVs, new mobility, e-commerce, and the sharing economy are changing our cities. He is also the cofounder and codirector of the Sustainable Cities Institute, a nationally and internationally awarded multidisciplinary organization that focuses on sustainability issues as they relate to the built environment. Professor Larco has worked directly with many cities and States to examine the impacts, or potential impacts, of emerging technologies, and help them to begin to plan for the future.

I am pleased he could join us today, and I am looking forward very much to hearing his testimony.

Thank you, Madam Chair.

Ms. NORTON. Thank you, Mr. Chair.

Professor Larco, you are recognized for 5 minutes.

Mr. LARCO. Thank you. Thank you, Chairman DeFazio, for that introduction.

Chair Norton, Ranking Member Davis, and subcommittee members, thank you for this opportunity to testify on the future of AVs, and the impacts they could have on communities.

I also want to give particular thanks to Chairman DeFazio for all you do for the country, and for the State of Oregon. I very much appreciate it.

My name is Nico Larco, and I am a professor of architecture and design, as well as the director of the Urbanism Next Center at the University of Oregon.

Urbanism Next, as was mentioned, is a cross-disciplinary center focused on understanding the impacts that emerging technologies such as AVs, new mobility, and e-commerce are having and will continue to have on communities. Our focus is not on the mechanics of the technologies, but rather on their impacts on land use, urban design, building design, transportation, and real estate, and why these impacts matter for equity, health, safety, the environment, and the economy. We work extensively on these topics with cities and States throughout the country, private-sector partners who are developing or deploying emerging technologies, professional organizations, other research organizations, and foundations.

Our country is at the earliest stages of developing AV technologies and real-world AV testing. What we don't know about AVs at this moment far outweighs what we do know about them and how they will impact our communities.

That said, one thing that is clear is that AVs are not just another vehicle, in the same way that, over a century ago, cars were just not a different horse. Our research indicates that AVs could have widespread cascading impacts on communities. And because of this, we need to be sure to shape AV deployment to serve community goals.

Research points to AVs having both positive and negative transportation impacts. For instance, we suspect that AVs will cause increases in congestion in local streets, similar to the hours of delay we are already seeing caused by rideshare companies. On the posi-

tive side, they could lead to large drops—up to 80 or 90 percent—in the demand for parking, and if they are used in transit vehicles, potential improvements in transit frequency and coverage. Those transit service improvements, as you have heard, might, however, also come with large impacts on labor, and AVs could actually pull riders away from transit. Similarly, AV trips may simply cost so much that AV travel could become a transportation choice for the wealthy, but with their implications shouldered by everyone.

But AVs are not only a transportation issue. This is an important point that I want to make. AVs will have cascading impacts on communities beyond transportation impacts. For instance, AVs have the potential to exacerbate sprawl, allowing people to drive further distances on freeways in less time. This would lead to increasing land consumption, and would impact infrastructure, the environment, and equity.

Another example, reduced parking demand would open up existing parking lots for cities for other forms of development. We could fill parking lots with housing, offices, shops, and services, increasing accessibility. Not needing to build parking would allow us to actually put more development on any one parcel, and would bring down the cost of development, increasing affordability.

At the same time, the shift in parking demand would increase the supply of land available for development in a community. If supply increases and demand stays the same, this could negatively impact land prices. This is true for urban and suburban areas, with areas that currently have the largest amounts of parking the most affected by these changes.

Regarding Government revenues, AVs could significantly impact the revenues of governments that use fuel tax, vehicle registration, licensing, parking fees, and traffic citations to fund transportation infrastructure and operations. A study conducted by my colleagues at the University of Oregon found that revenue losses could be between 3 and 51 percent, with the direst predictions being for cities that heavily depend on fuel taxes and parking fees to fund transportation.

AVs could also have substantial impacts on equity. In work we have done with the Knight Foundation and Cityfi, and with AARP and the RAND Corporation, we found large areas of concern regarding who has access to AVs. Older adults and lower income individuals are most at risk of falling by the wayside if these accessibility issues are not directly addressed.

With these points in mind, we suggest the following recommendations.

First, fund pilots specifically focused on the cascading impacts of AVs. Don't only focus on AV technology, efficiency, and safety, which are very important, but also expand that to address cascading impacts of AVs. And pilots should not only focus on large cities, but also mid-sized, small, and rural communities. If we don't, we won't understand the cascading impacts in these areas, and these communities will be ill-prepared and likely suffer adverse effects from future AV deployment.

Second, support research on the cascading impacts of AVs. Similar to the points regarding pilots, we also need research that goes beyond the focus on the technology, safety, or deployment, and ex-

pands to understand cascading impacts. The Center of Excellence for Automated Vehicles and New Mobility in the IIJA is a promising step forward, and we are very thankful to Representative Blumenauer, who first presented the PLACE Act language that was the basis for the center. We need more programs such as this.

Third, assist local governments and States with regulatory preparedness. This encompasses not only enabling regulations, such as permitting infrastructure, insurance, and emergency response policy, but also understanding governmental roles in how best to steer deployment towards community goals, how to use tools and levers, and how to incorporate community engagement.

Fourth, organize and lead a national dialogue on AV impacts and community needs. We hear consistent desire from both public and private sector for forums to organize and share research and best practices on the many aspects of AV deployment.

In closing, I want to say that our AV future is not preordained. It is ours to shape. But we can only adequately shape the future if we understand not only the technical requirements of AVs or the regulations enabling deployment, but also the cascading impacts AVs will have on our communities, and the regulations, tools, and leverage that we can use to shape deployment to support community goals.

Thank you for this opportunity to speak with you, and I look forward to answering your questions.

[Mr. Larco's prepared statement follows:]

Prepared Statement of Nico Larco, AIA, Director and Professor, Urbanism Next Center, University of Oregon

Chair Norton, Ranking Member Davis, and Subcommittee Members, thank you for this opportunity to testify on the future of automated vehicles and the impacts they could have on communities throughout the country.

My name is Nico Larco and I am a Professor of Architecture and Urban Design as well as the Director of the Urbanism Next Center at the University of Oregon. Urbanism Next is a cross-disciplinary center focused on understanding the impacts that emerging technologies such as automated vehicles (AVs), new mobility, and e-commerce are having and will continue to have on communities. Our focus is not on the mechanics of the technologies, but rather on their impacts on land use, urban design, building design, transportation, and real estate, and why these impacts matter for equity, health, safety, the environment, and the economy. We work extensively on these topics with cities and states throughout the country, as well as with private sector partners who are developing or deploying emerging technologies, professional organizations, other research organizations, and foundations. We have found a tremendous interest, across all these organizations, in understanding AVs' impacts and how to shape the deployment of emerging technologies to help achieve equity, sustainability, and economic goals.

Our country is at the earliest stages of developing AV technology and testing its performance in real world situations. What we don't know about AVs at this moment far outweighs what we do know about them and how they will impact our communities. One thing that is certain is the need to pay attention to AVs' transportation impacts as well as the cascading impacts they will have on communities. This includes issues such as safety, accessibility, congestion, equity, environmental, and land development impacts.

AVs are not just another vehicle—in the same way that over a century ago cars proved to be not just a different horse. I will describe how AVs might create cascading impacts beyond moving people and goods, and how they have the potential to substantially reshape our communities. The current degree of unknowns around this innovation, and the potential scale of impacts, suggests caution in the speed of AV deployment, a need for substantial pilots and research focused on cascading impacts, a need for federal, state, and local governments to work together on AV

regulatory preparedness, and information sharing between all levels of government, the private sector, researchers, and concerned stakeholders.

TRANSPORTATION IMPACTS

AVs have a strong potential to impact travel behavior, mode choice, and freight movement which would have a profound effect on congestion, parking, transit, and travel costs.

Congestion—While it is difficult to know the exact future impacts AVs will have on congestion, we do have insights that can guide us. We can think of ridesharing companies such as Uber and Lyft as proxies for future AV deployment. Both follow a similar model of calling a vehicle, having it pick-up a passenger, driving them to their destination, and then leaving to serve another trip. Studies on ridesharing’s impact on congestion have shown that it leads to sizable inefficiencies as cars travel substantial distances without passengers onboard as they travel to pick up passengers and then reposition themselves after a drop-off.ⁱ With ridesharing, these ‘empty vehicle miles’ or ‘zombie miles’ are approximately 40% of total vehicle miles travelled (VMT).ⁱⁱ A study in San Francisco found that between 2010 (when ride-sharing companies were introduced) and 2016, ridesharing contributed to a 62% increase in hours of delay.ⁱⁱⁱ We suspect shared AVs will follow these same patterns and that owners of private AVs could have similar ‘empty vehicle mile’ impacts as they send cars to run errands, pick up other family members, or simply have a car drive around the block while they complete a task. AVs could potentially reduce some of this impact on congestion if they are able to increase travel flow by reducing stop-and-start behavior. However, an AV future that does not have controls in place could exacerbate the congestion trends we are seeing with rideshare, putting increased strain on our transportation system.^{iv} This would impact infrastructure costs, the environment, and economic output.

Parking—AVs could reduce the demand for parking as vehicles drop off passengers and move on to their next trip instead of needing to be parked. Shared AVs in particular are predicted to reduce parking demand by as much as 90%.^v Considering rideshare as a proxy for AVs, we are already seeing a 19.7% reduction in parking per passenger at airports due to high rates of ridesharing use.^{vi} Changes in parking demand can have significant impacts on cities as parking is currently the largest single land use in urban areas as measured by surface area.^{vii}

Transit—AVs have the potential to complement transit and/or compete with it, as we are finding with rideshare. On the one hand, AVs could be a boon to transit if the technology is applied to transit vehicles, adding technology costs, but reducing operating costs due to the reduced need for drivers. Labor currently represents up to 60% of transit agency expenditures.^{viii} Eliminating the need for drivers would have serious labor consequences but could also potentially create savings that increase frequency of service and service area expansion. On the other hand, riders who can afford it may use personal or rideshare AVs in place of transit, reducing overall transit ridership and leading to a reduction of service frequency and coverage.

Travel Costs—Travel costs could change substantially with AVs. Increased technology and maintenance needs will potentially increase travel costs, while insurance, parking, and fuel cost savings could bring costs down. The overall scale or

ⁱBruce Schaller, “The New Automobility: Lyft, Uber, and the Future of American Cities” (Schaller Consulting, July 25, 2018), <http://www.schallerconsult.com/rideservices/automobility.htm>.

ⁱⁱMelissa Balding et al., “Estimated TNC Share of VMT in Six US Metropolitan Regions (Revision 1)” (Fehr and Peers, August 6, 2019), <https://drive.google.com/file/d/1FIUsvKj9lsAnWJQ6kLhAhNoVLjffDx3/view>.

ⁱⁱⁱErhardt Gregory D. et al., “Do Transportation Network Companies Decrease or Increase Congestion?” *Science Advances* 5, no. 5 (n.d.): eaau2670, <https://doi.org/10.1126/sciadv.aau2670>.

^{iv}Tom Cohen and Clémence Cavoli, “Automated Vehicles: Exploring Possible Consequences of Government (Non)Intervention for Congestion and Accessibility,” *Transport Reviews* 39, no. 1 (January 2, 2019): 129–51, <https://doi.org/10.1080/01441647.2018.1524401>.

^vWenwen Zhang and Subhrajit Guhathakurta, “Parking Spaces in the Age of Shared Autonomous Vehicles: How Much Parking Will We Need and Where?,” *Transportation Research Record* 2651, no. 1 (2017): 80–91.

^{vi}Transportation Research Board and Engineering National Academies of Sciences and Medicine, *Rethinking Airport Parking Facilities to Protect and Enhance Non-Aeronautical Revenues* (Washington, DC: The National Academies Press, 2021), <https://doi.org/10.17226/26091>.

^{vii}Donald Shoup, *The High Cost of Free Parking*, Revised edition (Planners Press, 2011).

^{viii}MacPherson Hughes-Cromwick and Matthew Dickens, “2019 Public Transportation Fact Book” (Washington D.C.: American Public Transportation Association, April 2019), http://apta.com/wp-content/uploads/APTA_Fact-Book-2019_FINAL.pdf.

final direction of impacts are yet unknown but estimates for future AV travel ranges from \$0.60–\$1.00 per vehicle mile for privately owned AVs, and \$0.50 to \$1.00 per vehicle-mile for shared AVs. While this is considerably less than current rideshare or taxi vehicle-mile costs, it is substantially more than personal vehicle costs or public transit fares (\$0.20–\$0.60 per passenger-mile).^{ix}

CASCADING IMPACTS

AVs are not only a transportation issue as their transportation impacts will have cascading impacts across communities. The attached Urbanism Next Framework describes some of these impacts across a range of domains and we further elaborate on these topics in our Multilevel Impacts of Emerging Technology on City Form and Development Report (based on Urbanism Next’s NSF Smart and Sustainable Communities Grant).^x Below we highlight cascading impacts on sprawl, government revenue, the environment, land and development opportunities, and equity.

Sprawl—A large question with widespread AV deployment is how it might impact metropolitan footprints and sprawl. The average commute in the US is approximately 27 minutes in each direction.^{xi} AVs promise to reduce the friction of travel as they will purportedly move faster along freeways and arterials, while at the same time giving occupants the ability to do more while they commute as they do not need to drive themselves. With this, individuals might be willing to move farther out in search of less expensive housing, opening exurban areas to development, and increasing pressures on sprawl. This, of course, accelerates the conversion of agricultural lands, natural resource lands, and habitat areas into housing and urban development, impacting the environment, infrastructure costs, and equity.

Government Revenue—Not only might AVs cost riders more, they could also significantly impact the revenues of governments that use fuel tax, vehicle registration, licensing, parking fees, and traffic citations to fund transportation infrastructure and operations.^{xii} A study conducted by my colleagues at the University of Oregon found that revenue losses could be between 3 and 51% with the direst predictions being for cities that heavily depend on fuel taxes and parking fees to fund transportation.^{xiii}

Environment—AVs could create both benefits and challenges for the environment. For instance, as previously mentioned, expanded sprawl could significantly increase land consumed by urban development, destroying existing habitat, disrupting natural water systems, and putting more people at risk of wildfire in the wildland urban interface. Regarding energy, AVs have the potential to reduce energy consumption by accelerating the shift to vehicle electrification, and increasing opportunities for platooning, route efficiency, and the elimination of stop-and-go driving behavior.^{xiv} Increases in the number of trips taken and the total amount of vehicle miles travelled, however, could dampen these impacts. Depending on the overall scale and direction of energy use, AVs could shift greenhouse gas (GHG) emissions and particulate pollution.

^{ix}Todd Litman, “Autonomous Vehicle Implementation Predictions: Implications for Transport Planning” (Victoria Transport Policy Institute, December 17, 2021), <https://www.vtpi.org/avip.pdf>; Ashley Nunes and Kristen D. Hernandez, “Autonomous Taxis & Public Health: High Cost or High Opportunity Cost?” *Transportation Research Part A: Policy and Practice* 138 (August 1, 2020): 28–36, <https://doi.org/10.1016/j.tra.2020.05.011>; Bureau of Labor Statistics, “Per-Mile Costs of Owning and Operating an Automobile (Current Dollars)—Bureau of Transportation Statistics,” 2020, <https://www.bts.dot.gov/content/mile-costs-owning-and-operating-automobile>; Junia Compostella et al., “Near- (2020) and Long-Term (2030–2035) Costs of Automated, Electrified, and Shared Mobility in the United States,” *Transport Policy* 85 (January 1, 2020): 54–66, <https://doi.org/10.1016/j.tranpol.2019.10.001>.

^xAmanda Howell et al., “Multilevel Impacts of Emerging Technologies on City Form and Development” (Portland, OR: Urbanism Next Center, January 2020), <https://www.urbanismnext.org/resources/multilevel-impacts-of-emerging-technologies-on-city-form-and-development>.

^{xi}Charlynn Burd, Michael Burrows, and Brian McKenzie, “Travel Time to Work in the United States: 2019,” *American Community Survey Reports, United States Census Bureau* 2 (2021): 2021.

^{xii}Benjamin Clark, Nico Larco, and Roberta F. Mann, “The Impacts of Autonomous Vehicles and E-Commerce on Local Government Budgeting and Finance” (University of Oregon, August 2017).

^{xiii}Rebecca Lewis and Benjamin Y. Clark, “Retooling Local Transportation Financing in a New Mobility Future,” *Transportation Research Interdisciplinary Perspectives* 10 (June 1, 2021): 100388, <https://doi.org/10.1016/j.trip.2021.100388>.

^{xiv}Pantelis Kopelias et al., “Connected & Autonomous Vehicles—Environmental Impacts—A Review,” *Science of The Total Environment* 712 (April 10, 2020): 135237, <https://doi.org/10.1016/j.scitotenv.2019.135237>.

Land Value and Development Opportunities—Reduced parking demand could lead to existing parking areas becoming available for development. Parking requirements often limit how much housing developers can put on a given parcel. More and more communities across the US are choosing to prioritize space for people instead of cars through the reduction or elimination of those requirements. AVs could provide an attractive option for getting around without a personal vehicle, opening up these parcels to development.

AVs could also lead to an increase in the density of development possible on a given parcel as parking provision would no longer limit how many units of housing could be built. Reducing the need to build parking can also reduce the cost of development, increasing the affordability of housing, for instance, and increasing the number of projects that are economically viable. This might impact both urban and suburban areas, with greater impact in areas with the greatest amount of existing parking. The ability to redevelop land currently dedicated to parking could radically increase the land available for development, reducing the cost for that land.

Equity Impacts—AVs have the potential to increase road safety, an important equity concern as traffic crashes disproportionately impact low-income Americans^{xv} and carry a heavier burden in terms of the costs of recovery from crashes. AVs impacts on accessibility, however, is not yet certain. Accessibility will be determined by issues such as the cost of trips and vehicles, if vehicles serve all areas of a region, if they physically accommodate users who are disabled, if users are sufficiently tech enabled, and in the model of shared vehicles, if users are banked and have access to digital banking. Research we conducted with the RAND Corporation for the American Association of Retired Persons (AARP) specifically pointed to these types of issues creating substantial barriers to AV use by older adults.^{xvi} These barriers are not insurmountable, and many researchers and leading AV and rideshare companies are working on solutions to them, but firm solutions are by no means clear at this point.

RECOMMENDATIONS

To address the issues and challenges described above, we suggest the following recommendations to help shape AV deployment in ways that can support community needs:

1. *Fund Pilots Specifically Focused on the Cascading Impacts of AVs*—Pilots are an effective way of learning about the impacts of deployment and both the benefits and unintended consequences they might have. It is critical that pilots not only focus on technological developments, efficiency, and safety, but also focus on the operational impacts and the cascading impacts autonomous vehicles will have on communities. These pilots should also not only focus on large cities, or predominantly on the wealthy areas of these cities, but instead should also include mid-sized, small, and rural communities. These pilots should specifically include low-income areas, areas with poor transit access, and areas with a high number of older adults. If these communities are not included in the testing and piloting of these technologies now and we are not able to understand the impacts AVs will have on them, these communities will be ill prepared and will likely suffer adverse impacts from AV deployment in the future.

For example, in pilots funded by the Knight Foundation, the Urbanism Next Center at the University of Oregon, along with Cityfi, is working with cities across the country to understand how AV deployment might impact communities and how to best engage vulnerable communities in these conversations. These types of pilots, that go beyond the technical aspects of AV deployment, provide needed insights about what it will take to ensure that the benefits of the technology are felt by all. Additionally, these pilots allow government agencies to learn more about the technology before adopting potentially far-reaching legislation without a nuanced understanding of both the opportunities and challenges.

The inclusion of the Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program in the IIJA is an excellent start, but this pro-

^{xv} Robert B. Noland, Nicholas J. Klein, and Nicholas K. Tulach, “Do Lower Income Areas Have More Pedestrian Casualties?,” *Accident Analysis & Prevention* 59 (October 1, 2013): 337–45, <https://doi.org/10.1016/j.aap.2013.06.009>; Sam Harper, Thomas J. Charters, and Erin C. Strumpf, “Trends in Socioeconomic Inequalities in Motor Vehicle Accident Deaths in the United States, 1995–2010,” *American Journal of Epidemiology* 182, no. 7 (October 1, 2015): 606–14, <https://doi.org/10.1093/aje/kwv099>.

^{xvi} Laura Fraade-Blanan et al., “Older Adults, New Mobility, and Automated Vehicles” (Portland, OR: Urbanism Next Center, RAND Corporation, and AARP, February 2021), <https://www.urbanismnext.org/resources/older-adults-new-mobility-and-automated-vehicles>.

gram is focused primarily on transportation efficiency and safety and not on the range of unresolved cascading impacts I have described earlier. We would encourage the expansion of the program, or the development of a new program of pilots that focus on the cascading impacts of autonomous vehicles. Pilots should be sure to include a range of AV vehicle types including passenger cars, SUVs, vans, busses, shuttles, and delivery vehicles including trucks, delivery vans, and drones.

2. *Support Research on the Cascading Impacts of AVs*—While AVs are in an early stage of deployment, we are in an even earlier state of properly understanding the impacts of AV deployment. Much research has been done on AV technology and on the transportation impacts, but what is largely missing and much needed is an understanding of AVs’ impacts on land use, urban design, building design, and real estate—and an understanding of the implications this will have on equity, health, the environment, and the economy.

The ‘Center of Excellence for Automated Vehicles and New Mobility’ in the IIJA is a promising step forward and we are thankful to Rep. Blumenauer who first presented the PLACE Act language that was the basis for this Center. We are also heartened with the launch of programs such as the Inclusive Design Challenge by USDOT. We encourage an expansion of these types of programs to give us the knowledge we need to make informed decisions that can maximize the benefits of AVs while eliminating or minimizing potential negative impacts.

3. *Assist Local Governments and States with AV Regulatory Preparedness*—Local governments and states are just beginning to understand the need to manage AV deployment in a way that can serve community goals. This encompasses not only enabling regulations (such as permitting, infrastructure, insurance, and emergency response policy), but also understanding governmental roles in how to best steer deployment. This includes understanding how best to conduct public education and engagement, how to leverage governmental roles in the shaping of the AV market, how best to develop relationships with private sector AV service providers, how to mitigate externalities such as potential congestion on roads and at the curb, and how to establish a healthy AV ecosystem.

Local governments and states also need guidance on how to create tools and incentives to support equitable deployment through mechanisms such as vehicle accessibility requirements, service coverage requirements, and ride reservation and payment options. Cities and states are also interested in how best to utilize fees, taxes, vehicle occupancy requirements, and vehicle miles traveled maximums to achieve community goals. Additionally, cities and states need assistance with setting data standards and data sharing protocols, addressing curbside management, and understanding what infrastructure investments are most beneficial to their communities. (See the attached ‘Summary of Tools and Levers for Shaping AV Outcomes’ table. This table is adapted from Urbanism Next’s report with Cityfi, funded by the Knight Foundation, which includes a more expansive discussion of regulatory issues around AV deployment).^{xvii}

4. *Organize and Lead a National Dialogue on AV Impacts and Community Needs*—In our work with federal, state, and municipal governments, private sector companies, and research, professional, and advocacy groups, we hear a consistent desire for forums to organize and share research and best practices on the many aspects of AV deployment. There is a general understanding that the successful deployment of AVs, in both a societal sense and a business sense, will require the cooperation of the public, private, advocacy, and academic/research sectors. The federal government and particularly the USDOT, HUD, EPA, and DOL are all well positioned to partner with national organizations to lead this type of effort.

As an example of helping create a national dialogue, Urbanism Next has held an annual conference since 2018 focused on the cascading impacts of technologies such as AVs. We have done this in partnership with the American Planning Association (APA), the Urban Land Institute (ULI), the American Institute of Architects (AIA), the Oregon Chapter of the American Society of Landscape Architects (ASLA), and numerous other private and public sector partners. This last year—with support from NUMO and in partnership with POLIS and TNO, the conference expanded to Europe. There is widespread interest in better understanding the impacts of AV deployment.

^{xvii} Becky Steckler et al., “A Framework for Shaping the Deployment of Autonomous Vehicles and Advancing Equity Outcomes” (Portland, OR: Urbanism Next Center, January 2021), <https://www.urbanismnext.org/resources/a-framework-for-shaping-the-deployment-of-autonomous-vehicles-and-advancing-equity-outcomes>.

Urbanism Next, also with funding from NUMO, has also developed the NEXUS (<https://www.urbanismnext.org/the-nexus>)—a one-stop resource for communities, elected officials, private sector companies, researchers, and other stakeholders interested in learning about the cascading impacts of AV deployment. As an example of the interest in these topics, the site has been visited over 100,000 times in the last year alone.

Contrary to what may have been the landscape a few years ago, many private sector companies are interested in engaging in these topics and see developing alignment between their goals and community goals as a benefit to their business models. We need to help develop these conversations and build trust so that the best aspects of emerging AV technologies are the outcomes we ultimately attain in our communities.

In closing, we believe we stand at this moment in a situation not dissimilar to where our country stood when the first automobiles were rolling onto our streets over a century ago. Imagine if, at that moment, we had the foresight to consider how automobiles would be used throughout the country, the benefits they could deliver, and also the problems they might create. Imagine if we could shape early deployment and the eventual design of our cities and streets to help reduce congestion, increase accessibility, limit sprawl, and increase equity.

Our AV future is not preordained, it is ours to shape. But we can only adequately shape the future if we understand not only the technical requirements of AVs or the regulations enabling deployment, but also the cascading impacts AVs will have on our communities, and the regulations, tools, and levers we can use to shape deployment to support community goals.

This testimony was prepared by Nico Larco, Becky Steckler, and Amanda Howell of the Urbanism Next Center at the University of Oregon.

Urbanism Next Center—<http://urbanismnext.org/>

ATTACHMENTS

Urbanism Next Framework—[Editor's note: The document is retained in committee files and is available online at <https://docs.house.gov/meetings/PW/PW12/20220202/114362/HHRG-117-PW12-Wstate-LarcoN-20220202-SD002.pdf>]

Summary of Tools and Levers for Shaping AV Outcomes table—[Editor's note: The document is retained in committee files and is available online at <https://docs.house.gov/meetings/PW/PW12/20220202/114362/HHRG-117-PW12-Wstate-LarcoN-20220202-SD001.pdf>]

Ms. NORTON. Thank you, Professor Larco.

We will hear next from Mr. Ariel Wolf, general counsel, Autonomous Vehicle Industry Association.

Mr. WOLF. Chair Norton, Ranking Member Davis, Chair DeFazio, Ranking Member Graves, members of the subcommittee, good morning. My name is Ariel Wolf, and I serve as general counsel to the Autonomous Vehicle Industry Association, on whose behalf I appear today. I also serve as a partner at the law firm Venable, where I chair the autonomous and connected mobility practice. Thank you for giving me the opportunity to testify at this important hearing.

The Autonomous Vehicle Industry Association was founded as the unified voice of the AV industry. We are committed to bringing the tremendous safety, mobility, and economic benefits of AVs—otherwise known as SAE Level 4- and 5-capable vehicles—to consumers in a safe, responsible, and timely manner.

For a dozen years, AV technology has been tested on our roads, over tens of millions of miles, and maintains a remarkable safety record. At the same time, roadway fatalities in this country involving vehicles with human drivers have increased dramatically. As members of the subcommittee already know, just yesterday the Na-

tional Highway Traffic Safety Administration reported that 31,720 Americans died on the roads in the first 9 months of 2021. Those 31,720 deaths represent the highest number of fatalities in the first 9 months of any year in the past 15 years.

The 2021 fatality numbers are part of a pattern of increasingly unsafe driving that is occurring across the country. Last week, in its new National Roadway Safety Strategy, the U.S. Department of Transportation reaffirmed what we have known for many years: human behavior is a contributing factor to the overwhelming majority of crashes, including drunk, impaired, distracted, and reckless driving.

The AV industry was established to confront the monumental and ongoing tragedy on our roads. While AV technology continues to develop and advance, the simple fact is that AVs do not drive drunk, they do not drive while texting, they do not fall asleep at the wheel, and they do not recklessly speed. The record is clear: autonomous vehicles are being developed safely, and they will make our roads safer.

To reduce fatalities and injuries, Americans need a comprehensive approach to roadway safety that includes a full suite of solutions, from safer road design to driver impairment prevention systems to updated traffic guidance. But the approach must also include the deployment of autonomous vehicles.

AV technology will also transform our transportation system by making it more accessible, efficient, and sustainable. Just last week, I visited several AV Industry Association members to see firsthand how this transformation is taking shape. I rode on AVs that are safely navigating the streets of cities like San Francisco, Las Vegas, Phoenix, Miami, and Pittsburgh. I climbed into autonomous trucks that are hauling freight in States like Texas and New Mexico to boost our supply chains. I saw how zero-occupant electric delivery vehicles are expanding access to fresh food and reducing emissions.

To experience AV technology and to see its capabilities is to understand the opportunities for this industry to change our lives for the better.

On a personal note, I think about safer streets for my four daughters as they grow up, expanded independence for my grandmother in Florida and for my parents and in-laws as they get older, and opportunities to expand equitable transportation and delivery options in my neighborhood here in DC. I see this happening, all while growing the economy and creating new, well-paying jobs.

The AV industry is creating jobs and providing opportunities for workers with a wide array of expertise and educational backgrounds, including many jobs that do not require a college degree. In locations across the country, AV developers and manufacturers are hiring auto technicians, fleet managers, safety operations specialists, and many others to support the testing and deployment of AV technology.

One study found that the AV industry has created 6,500 new jobs in the Pittsburgh region alone. A recent U.S. Department of Transportation study also indicated that adoption of AV trucking will increase total U.S. employment by as many as 35,000 jobs per year, on average, and raise annual earnings for all U.S. workers.

Given the phased timeline for AV truck deployment, autonomous trucking is not expected to displace jobs in the trucking industry, but rather serve as one tool to reduce strains on the supply chain caused in part by the longstanding truckdriver shortage.

AVs offer great opportunities. But without a national framework that maximizes the deployment of the technology, it will be harder to achieve those benefits.

I want to thank the subcommittee for its leadership on these important issues. The Autonomous Vehicle Industry Association looks forward to serving as a resource concerning both technical and policy questions in this area, and working with you to make autonomous vehicles a reality for Americans nationwide. We are eager to engage with Congress, the Department of Transportation, and all stakeholders on the right policies to accomplish our shared goals: safer streets, expanded mobility, and new jobs and economic growth.

And I look forward to answering any questions you may have.

[Mr. Wolf's prepared statement follows:]

Prepared Statement of Ariel Wolf, Esq., General Counsel, Autonomous Vehicle Industry Association

Chair Holmes Norton, Ranking Member Davis, Members of the Subcommittee, good morning, my name is Ariel Wolf, and I serve as General Counsel to the Autonomous Vehicle Industry Association, on whose behalf I appear today. I also serve as a partner at the law firm Venable LLP, where I head the Autonomous and Connected Mobility practice. Thank you for giving me the opportunity to provide testimony for this hearing today.

The Autonomous Vehicle Industry Association (“Association”) was founded in April 2016 by Ford Motor Company, Waymo, Lyft, Volvo Cars, and Uber to be the voice of the nascent autonomous vehicle (“AV”) industry. Since then, we are proud to have tripled in size, adding many of the world’s leading technology, trucking, ridesharing, and automotive companies as members of the Association.¹ This cross-section of companies demonstrates the widespread interest in developing AV technology across different sectors. As the unified voice of the AV industry, we are committed to bringing the tremendous safety and mobility benefits of AVs to consumers in a safe, responsible, and expeditious manner.

Our mission is to realize the benefits of AVs—otherwise known as SAE Levels 4- and 5-capable vehicles—and support the safe and timely deployment of this technology. For a dozen years, AV technology has been tested on our roads for tens of millions of miles and maintains a remarkable safety record. At the same time, as I will discuss, roadway fatalities in this country involving vehicles with human drivers have gone up dramatically. So let me be clear at the outset of this discussion: *autonomous vehicles will save lives, which is why the AV industry is so committed to developing this technology and to deploying it in a timely manner.*

AV technology not only will make our roads safer, but also can transform our transportation system by making it more accessible, efficient, and sustainable. Just last week I visited several AV Industry Association members to see firsthand how this transformation is taking shape. I rode in AVs that are being used to safely navigate the streets of San Francisco, Las Vegas, Phoenix, Miami, Pittsburgh and other cities across the country. I climbed into autonomous trucks that are hauling freight in Texas, New Mexico, and beyond, and that are helping to solve our supply chain crisis and reduce costs to consumers. I saw how zero-occupant electric delivery vehicles are expanding access to fresh food and reducing emissions. To experience AV technology and see its capabilities is to understand the potential for this industry to change our lives for the better. On a personal note, I think about safer streets for my four daughters as they grow up; expanded independence for my grandmother in Florida and for my parents as they soon enter retirement; opportunities to ex-

¹ AV Industry Association members include Argo AI, Aurora, Cruise, Embark, Ford, Kodiak, Lyft, Motional, Navya, Nuro, TuSimple, Uber, Volvo Cars, Waymo and Zoox.

pand equitable transportation options to all communities here in DC where I live. And I see this happening all while we can grow the economy and expand job creation.

I. AVS OFFER SIGNIFICANT BENEFITS TO CONSUMERS, WORKERS, AND THE ECONOMY

AVs have the potential to: (a) improve road safety; (b) improve transportation equity; and (c) create jobs and broadly benefit the American economy.

A. AVs Will Improve Road Safety

As members of the Subcommittee may know, the National Highway Traffic Safety Administration (“NHTSA”) reported that 20,160 Americans died on the road in the first six months of 2021—an increase of 18.4 percent over 2020 and more fatalities than in any first half-year over the past 15 years.² In fact, in 2020, despite fewer vehicles on the road and fewer vehicle miles traveled compared to the previous year, the number of deaths on the road was the highest it had been since 2007.³ As terrible a tragedy as these numbers reflect, the toll cannot be measured in fatalities alone. Since 2016, the number of motor vehicle crashes resulting in injury has averaged nearly 2 million per year.⁴ According to the National Safety Council, the estimated cost of motor-vehicle deaths, injuries, and property damage in the first half of 2021 was \$241.9 billion.⁵

The 2021 fatality numbers are part of a pattern of increasingly unsafe driving that is occurring across the country. According to the U.S. Department of Transportation (“USDOT”), human behavior is a contributing factor to the overwhelming majority of serious and fatal crashes;⁶ NHTSA attributes an increasing share of roadway fatalities to distracted driving and other risky driving behaviors. While AV technology continues to develop and advance, the simple fact is that AVs do not drive drunk, they do not text while driving, they do not fall asleep at the wheel, and they do not recklessly speed. And unlike human drivers, AVs do not present a risk of misusing driver assistance systems.

The AV industry was created to confront the monumental and ongoing tragedy on our roads—over the last ten years, there have been 374,432 reported deaths and nearly 16 million crashes with injuries on our roads due to human-operated vehicles. The remarkable safety record of autonomous vehicles, which have been involved in only one fatality in more than a decade of testing and deployments, gives me hope that we will be able to make progress against this public health crisis. The record is clear: *autonomous vehicles are being developed safely, and they will make our roads safer.*

As USDOT Secretary Buttigieg has recognized, we cannot accept the reality of our roads as the “cost of doing business.” Though we may have grown numb to the grim roadway statistics in our country, each fatality and injury is a tragedy that affects countless lives. To reduce fatalities and injuries, Americans need a comprehensive approach to roadway safety that includes a full suite of solutions, from safer road design to drunk-driving prevention systems, in addition to the deployment of AVs.

B. AVs Can Improve Transportation Equity

By improving safety and providing greater mobility, AVs will be a vital tool in securing transportation equity and connecting communities and individuals to the resources and jobs they need. Specifically, AVs will allow those who previously had limited or no access to a personal vehicle or transit system the freedom to travel, commute, and conveniently obtain goods and services.

²Nat'l Highway Traffic Safety Admin., U.S. Dep't of Transp., DOT HS 813 199, Early Estimates of Motor Vehicle Traffic Fatalities for the First Half (January–June) of 2021 1 (2021), <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813199> [hereinafter NHTSA Jan.–June 2021 Fatality Estimates].

³NHTSA Jan.–June 2021 Fatality Estimates.

⁴*National Statistics*, NAT'L CTR. FOR STAT. AND ANALYSIS, <https://cdan.nhtsa.gov/> (last visited Jan. 30, 2022). According to the National Safety Council, the number of “medically consulted injuries” from crashes is 4.5 million. See *Introduction*, NAT'L SAFETY COUNCIL: MOTOR VEHICLE INJURY FACTS OVERVIEW, <https://injuryfacts.nsc.org/motor-vehicle/overview/introduction/> (last visited Jan. 30, 2022).

⁵*Preliminary Semiannual Estimates*, NAT'L SAFETY COUNCIL, <https://injuryfacts.nsc.org/motor-vehicle/overview/preliminary-estimates/> (last visited Jan. 28, 2022).

⁶NATIONAL ROADWAY SAFETY STRATEGY, U.S. DEPT. OF TRANSP. 14 (Jan. 2022), https://www.transportation.gov/sites/dot.gov/files/2022-01/USDOT_National_Roadway_Safety_Strategy_0.pdf.

1. Roadway Safety and Equity

Roadway crashes, and the resulting injuries and deaths, are not evenly distributed across socioeconomic, racial, or ethnic groups. An analysis published by the Governors Highway Safety Association highlights the disproportionate number of traffic fatalities experienced by Black, Indigenous, and People of Color (“BIPOC”).⁷ In particular, per capita rates of traffic fatalities among American Indian/Alaskan Natives and Black populations were all higher than the national average,⁸ and pedestrian death rates per capita were higher than the national average for American Indian/Alaska Natives, Black, and Hispanic individuals.⁹ Estimates published by NHTSA indicate that these discrepancies have become exacerbated in recent years, with traffic fatalities of Black individuals up 23% in 2020 compared to 2019, while American Indian deaths rose 11%.¹⁰

This analysis and other research indicate that socioeconomic status can also influence the risk of motor vehicle crash involvement. Census tracts have recorded pedestrian fatality rates within low-income metropolitan areas approximately twice that of more affluent neighborhoods.¹¹ These patterns are echoed in a City of Chicago report revealing that Black residents and those living in communities with high levels of economic hardship were more at risk of dying in a traffic crash compared to white residents and those living in communities with low and medium levels of economic hardship, respectively.¹² By reducing crashes across the board, AVs can reduce these inequities and improve the quality of life for all communities.

2. Connecting Underserved Communities to Transit, Resources, and Jobs

AVs can provide vital connections to areas with high demand but low supply of transportation, otherwise known as transit deserts.¹³ Access to transportation and average length of commute are connected to upward mobility,¹⁴ and studies have found links between public transit access, income, and unemployment.¹⁵ A 2011 study showed that an average person can access only about 30% of all jobs and 25% of low- and middle-skilled jobs in a given metropolitan area via public transit within 90 minutes.¹⁶ AVs have the potential to reduce or eliminate gaps in transportation access by improving integration with mass transit, whether by providing both first mile and last mile connections to transit, servicing direct trips to workplaces and other endpoints, or by broadly increasing supply that helps free up other conventional and AV transportation options to build those linkages. Projections indicate that the transportation connections facilitated by the adoption of AVs would increase access to jobs within a metropolitan area by 45% by 2040.¹⁷ Through these various means, AVs will further connect Americans with a variety of key features of their communities, improving access and quality of life.

Access to food is another area of inequality that AVs can help alleviate. Transit deserts often overlap with food deserts, which are defined as areas with high poverty (20% or greater) and low access to food (at least 33% of people living more than

⁷ GOVERNORS HIGHWAY SAFETY ASS’N, AN ANALYSIS OF TRAFFIC FATALITIES BY RACE AND ETHNICITY 18 (2021), <https://www.ghsa.org/sites/default/files/2021-06/An%20Analysis%20of%20Traffic%20Fatalities%20by%20Race%20and%20Ethnicity.pdf> [Hereinafter GHSA RACE AND ETHNICITY ANALYSIS].

⁸ *Id.* at 8.

⁹ GHSA RACE AND ETHNICITY ANALYSIS at 13.

¹⁰ *Id.* at 18; NAT’L HIGHWAY TRAFFIC SAFETY ADMIN., U.S. DEP’T OF TRANSP., DOT HS 813 118, EARLY ESTIMATES OF MOTOR VEHICLE TRAFFIC FATALITIES AND FATALITY RATE BY SUB-CATEGORIES IN 2020 8 (2021), <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813118>.

¹¹ GOVERNING, AMERICA’S POOR NEIGHBORHOODS PLAGUED BY PEDESTRIAN DEATHS 1 (2014), http://media.navigatored.com/documents/Governing_Pedestrian_Fatalities_Report.pdf.

¹² VISION ZERO CHICAGO, ACTION PLAN 2017–2019 17, https://visionzerochicago.org/wp-content/uploads/2016/05/17_0612-VZ-Action-Plan_FOR-WEB.pdf.

¹³ *Frequently Asked Questions*, TRANSIT DESERT RESEARCH, <http://www.transitdeserts.org/faq.html> (last visited July 22, 2021).

¹⁴ Mikayla Bouchard, *Transportation Emerges as Crucial to Escaping Poverty*, N.Y. TIMES (May 7, 2015), <https://www.nytimes.com/2015/05/07/upshot/transportation-emerges-as-crucial-to-escaping-poverty.html>.

¹⁵ Gillian D. White, *Stranded: How America’s Failing Public Transportation Increases Inequality*, THE ATLANTIC (May 16, 2015), <https://www.theatlantic.com/business/archive/2015/05/stranded-how-americas-failing-public-transportation-increases-inequality/393419/>.

¹⁶ Adie Tomer Et Al., *Missed Opportunity: Transit and Jobs in Metropolitan America*, BROOKINGS (May 11, 2011), <https://www.brookings.edu/research/missed-opportunity-transit-and-jobs-in-metropolitan-america/>.

¹⁷ RICHARD EZIKE ET. AL., WHERE ARE SELF-DRIVING CARS TAKING US?, 6 (2019), <https://ucsusa.org/sites/default/files/attach/2019/02/Where-Are-Self-Driving-Cars-Taking-Us-web.pdf>.

one mile from a grocery store or supermarket).¹⁸ A 2017 report by the U.S. Department of Agriculture’s Economic Research Service (“ERS”) estimates that 54 million individuals, or 17.1 percent of the total U.S. population, had limited access to a supermarket or grocery store between 0.5 and 10 miles from their home.¹⁹ Further, a 2009 ERS report found that, at the time, 2.3 million people lived more than one mile from a supermarket and did not have access to a vehicle.²⁰ The COVID–19 pandemic has increased overall food insecurity—the lack of access to food due to financial constraints—across the nation, with projections suggesting that up to 42 million (1 in 8) people in the U.S. may experience food insecurity in 2021.²¹

AVs can prove particularly useful for improving access to food, both by transporting people to previously inaccessible or difficult to access supermarkets and grocery stores, and also by bringing food directly to their doors. AV companies are already preparing to use their vehicles in such ways, exemplified by Cruise delivering over one million meals to food-insecure families in San Francisco,²² TuSimple using autonomous trucks to deliver more than 3.5 million pounds of food (2.7 million meals) for food banks in Arizona,²³ and Nuro vehicles helping the Houston Food Bank feed people in Texas.²⁴ With more widespread deployment, AVs could improve access to fresh food for 14 million low-income households, with roughly 70% of the total low-income population living in food deserts.²⁵ The addition of safe and affordable options into the transportation ecosystem will create the capacity to execute on these trips.

3. Expanding Mobility Options for All

AV deployment offers new and improved transportation options for people with disabilities as well as for older residents. Studies by USDOT estimate that 25.5 million Americans have travel-limiting disabilities,²⁶ while roughly 560,000 people with disabilities never leave their homes due to transportation difficulties.²⁷ These difficulties are often due to a lack of accessible or convenient public transportation or an inability to operate their own vehicle, as is the case for the over 7.6 million Americans over the age of 16 who have significant vision impairment.²⁸ This lack of transportation impacts employment as well—only 17.5% of people with disabilities are employed, compared to 65% of people without a disability.²⁹

AVs can allow those with disabilities greater freedom to move about the world on their own schedule. AV mobility-as-a-service offerings can help improve transportation for individuals who cannot drive. For instance, Cruise has made public its work to develop a wheelchair accessible version of its Origin vehicle platform.³⁰ For low vision individuals, companies like Lyft, through a partnership with Motional and the National Federation of the Blind, have worked to create Braille guides for

¹⁸ Michele Ver Ploeg et al., *Mapping Food Deserts in the United States*, ECONOMIC RESEARCH SERVICE (Dec. 1, 2011), <https://www.ers.usda.gov/amber-waves/2011/december/data-feature-mapping-food-deserts-in-the-us/>.

¹⁹ ECON. RSCH. SERV., EIB–165, U.S. DEP’T OF AGRIC. LOW-INCOME AND LOW-SUPERMARKET-ACCESS CENSUS TRACTS, 2010–2015 12 (2017), <https://www.ers.usda.gov/webdocs/publications/82101/eib-165.pdf?v=3395.3>.

²⁰ ECON. RSCH. SERV., ACCESS TO AFFORDABLE AND NUTRITIOUS FOOD: MEASURING AND UNDERSTANDING FOOD DESERTS AND THEIR CONSEQUENCES iii (2009) https://www.ers.usda.gov/webdocs/publications/42711/12716_ap036_1.pdf?v=8423.6.

²¹ FEEDING AMERICA, THE IMPACT OF THE CORONAVIRUS ON FOOD INSECURITY IN 2020 & 2021 1 (2021), https://www.feedingamerica.org/sites/default/files/2021-03/National%20Projections%20Brief_3.9.2021_0.pdf.

²² Dan Ammann, *Introducing Cruise for Good*, MEDIUM (Apr. 23, 2021), <https://medium.com/cruise/introducing-cruise-for-good-8ebf9bfdaf4a>.

²³ *Hunger-Free AZ News*, ARIZ. FOOD BANK NETWORK (Summer 2020), https://azfoodbanks.org/wp-content/uploads/2020/09/AzFBN_S20_Newsletter_DIGITAL.pdf.

²⁴ Sola Lawal, *Serving America’s Food Deserts*, MEDIUM (July 15, 2020), <https://medium.com/nuro/serving-americas-food-deserts-a7442e922053>.

²⁵ *Id.*

²⁶ *Accessibility*, U.S. DEP’T OF TRANSP. (July 29, 2020) <https://www.transportation.gov/accessibility>.

²⁷ BUREAU OF TRANSP. STAT., TRANSPORTATION DIFFICULTIES KEEP OVER HALF A MILLION DISABLED AT HOME (2012), https://www.bts.gov/archive/publications/special_reports_and_issue_briefs/issue_briefs/number_03/entire.

²⁸ *Blindness Statistics*, NAT’L FED’N OF THE BLIND, <https://nfb.org/resources/blindness-statistics> (last visited Jan. 28, 2021).

²⁹ Economic News Release, U.S. Bureau of Labor Stat., Persons with a Disability: Labor Force Characteristics Summary (Feb. 24, 2021), <https://www.bls.gov/news.release/disabl.nr0.htm>.

³⁰ Sam Abuelsamid, *Cruise CEO Shows Off Locker Module and Wheelchair Accessible Origin Robotaxi*, FORBES (Oct. 6, 2021), <https://www.forbes.com/sites/samabuelsamid/2021/10/06/cruise-ceo-shows-off-locker-module-and-wheelchair-accessible-origin-robotaxi/?sh=567dd9d61c78>.

AV riders.³¹ Likewise, in Arizona, Waymo has highlighted the use of its AVs by vision impaired people of all ages, while its ongoing efforts to develop additional accessibility features were recognized by the federal government when the USDOT named the company as a semifinalist in its Inclusive Design Challenge.³²

Additionally, older populations also stand to benefit from the deployment of AVs. The number of Americans over the age of 65 grew by 34% between 2010 and 2020,³³ with 2016 estimates putting their total population at 46.2 million (10.6 million in rural areas alone).³⁴ By 2030, that number will grow to more than 70 million, or roughly 20% of the population.³⁵ While transportation challenges can vary greatly between individuals, roughly 600,000 older adults a year give up driving, with many more changing their driving habits as they age.³⁶ Studies have shown that older Americans without access to a car make 15% fewer trips to the doctor and 65% fewer trips to visit friends and family.³⁷

In particular, AVs are well positioned to assist older Americans as they navigate the world. As more people “age in place” by staying in their own homes, on-demand AVs could carry them to doctor’s appointments and shopping trips, and help them visit friends and family whenever they like.³⁸ AVs can also provide similar connections to the residents of retirement communities, as Voyage (now part of Cruise) did in a San Jose-based pilot program.³⁹ AVs can keep millions of older Americans connected to their families and communities, and allow them to retain their independence without risking their safety or the safety of vulnerable road users.

4. Connecting Rural Communities

AVs also serve as a useful tool in rural communities, which face many of the same problems as urban and suburban ones, with the added issue of individuals often having to travel much farther to take care of their needs. Rural areas are threatened by food deserts⁴⁰ while also facing motor vehicle death rates three to ten times higher than other areas.⁴¹ NHTSA’s 2020 early estimates project an 11% increase in rural road deaths in 2020,⁴² while 2017 numbers show more than half of all passenger vehicle occupant deaths occur on rural roads.⁴³ At the same time, approximately 40% of all rural residents live in areas with no public transportation.⁴⁴ Almost a quarter of all people over 65 live in rural areas,⁴⁵ leading to diminishing transportation options as they age in place. In rural areas, AVs are positioned to

³¹ Lyft, Aptiv, and the National Federation of the Blind Partner to Provide Rides to Blind and Low Vision Passengers, LYFT: BLOG (July 8, 2019), <https://www.lyft.com/blog/posts/lyft-aptiv-nfb-low-vision-riders>.

³² See Max’s Story, LET’S TALK AUTONOMOUS DRIVING, <https://ltad.com/story/maxs-story-foundation-for-blind-children.html> (last visited Jan. 28, 2022); Brian’s Story, LET’S TALK AUTONOMOUS DRIVING, <https://ltad.com/story/brians-story-foundation-senior-living.html> (last visited Jan. 28, 2022); Inclusive Design Challenge Semifinalists, U.S. DEP’T OF TRANSP., <https://www.transportation.gov/inclusive-design-challenge/inclusive-design-challenge-semifinalists#> Waymo (last visited Jan. 28, 2022).

³³ Press Release, U.S. Census Bureau, 65 and Older Population Grows Rapidly as Baby Boomers Age (June 25, 2020), <https://www.census.gov/newsroom/press-releases/2020/65-older-population-grows.html>.

³⁴ AMY SYMENS SMITH AND EDWARD TREVELYAN, ACS-41, U.S. CENSUS BUREAU, THE OLDER POPULATION IN RURAL AMERICA: 2012–2016 (2019), <https://www.census.gov/library/publications/2019/acs/acs-41.html>.

³⁵ Dabid Dudley, *The Driverless Car is (Almost) Here*, AARP THE MAG. (Dec. 2014/Jan. 2015), <http://www.aarp.org/home-family/personal-technology/info-2014/google-self-driving-car.html>.

³⁶ Transportation, NAT’L ASS’N OF AREA AGENCIES ON AGING, <https://www.n4a.org/transportation> (last visited Jan. 28, 2022).

³⁷ TRANSP. FOR AMERICA, AGING IN PLACE, STUCK WITHOUT OPTIONS: FIXING THE MOBILITY CRISIS THREATENING THE BABY BOOM GENERATION (2011), <https://t4america.org/docs/SeniorsMobilityCrisis.pdf>.

³⁸ Dudley, *supra* note 35.

³⁹ Tara Andringa, *When AVs Get Real, Attitudes Change*, MEDIUM (May 19, 2020) <https://medium.com/pave-campaign/when-avs-get-real-attitudes-change-2463101d4dcf>.

⁴⁰ LOIS WRIGHT MORTON AND TROY C. BLANCHARD, STARVED FOR ACCESS: LIFE IN RURAL AMERICA’S FOOD DESERTS, 1 RURAL REALITIES 1, 2007, <https://web.archive.org/web/20131021015542/http://www.ruralsociology.org/wp-content/uploads/2012/03/Rural-Realities-1-4.pdf>.

⁴¹ Passenger Vehicle Occupant (PVO) Deaths and Seat Belt Use among Rural Americans, CTR. FOR DISEASE CONTROL (Sept. 20, 2017), <https://www.cdc.gov/ruralhealth/motorvehicle/policybrief.html>.

⁴² NAT’L HIGHWAY TRAFFIC SAFETY ADMIN., *supra* note 10 at 1.

⁴³ *Id.*

⁴⁴ TRANSP. FOR AMERICA, *supra* note 37 at 10.

⁴⁵ *Id.* at 9.

provide the same safety and mobility improvements as they will elsewhere and to improve the quality of life for residents.

5. *Improving Public Health*

In addition, AVs can serve important environmental goals that advance public health.⁴⁶ Emissions from motorized vehicles are a major source of air pollution, which is a leading risk factor for mortality and morbidity.⁴⁷ Although the American Lung Association has found that more than 40% of Americans are living in places with unhealthy air, the effects of poor air quality are disproportionately experienced by BIPOC.⁴⁸ Specifically, the American Lung Association's most recent "State of the Air" report demonstrates that BIPOC were 61% more likely to live in a county with unhealthy air than white peers.⁴⁹

AVs can positively impact air pollution by reducing emissions as well as offer an array of significant environmental benefits, ranging from greater fuel efficiency and reduced congestion to reduced agricultural spoilage and related preservation of soil and water resources. In the context of emissions specifically, AVs are helping to lead the way on reducing emissions, with numerous companies already using battery electric vehicles ("EVs") or gasoline-electric hybrids for their AV fleets, and adoption of EVs is increasing. A study by Steer found that autonomous, electric local delivery vehicles could avoid more than 400 million tons of CO₂ from 2025–2035.⁵⁰ Embark Trucks has partnered with HP to help expedite this transition. The two companies are using Embark's network of transfer hubs to allow for the direct transfer of goods from autonomous-equipped trucks onto zero-emissions drayage vehicles which carry computer parts to their final destination. It is estimated that this process will remove up to 50,000 tons of carbon dioxide and other pollutants from HP's distribution network over the next decade.⁵¹ Additionally, a recent study demonstrated that AV trucks can reduce fuel consumption of heavy-duty trucks by at least 10% as a result of more efficient driving, resulting in a significant reduction of CO₂ emissions.⁵²

C. *AVs Can Create Jobs and Broadly Benefit the American Economy*

The AV industry is currently creating new jobs and bringing new investment, tax revenue, resources, and human capital to states across the country, including California, Arizona, Nevada, Pennsylvania, Michigan, Massachusetts, Florida, Washington, Colorado, Texas and the District of Columbia. A study performed for the Pittsburgh-based Regional Industrial Development Corporation found that in the Pittsburgh region alone the autonomous vehicle industry has created 6,500 new jobs, and the global autonomous vehicle industry could be worth \$1 trillion globally by 2026.⁵³ The further development of the AV industry is poised to support the economic competitiveness of American businesses and help grow the U.S. economy. Currently, the U.S. is the world leader in the AV industry due to the strength and breadth of American innovation in the industry. Policies that support the deployment of AVs are also policies that support the growth of the U.S. economy. By saving lives, creating jobs, and reducing costs for consumers the economic benefits of AVs promise to be significant in the decades to come. Additionally, AV trucking alone is anticipated to produce substantial economic benefits for both consumers and workers.

⁴⁶ See David Rojas-Rueda, et al., *Autonomous Vehicles and Public Health*, 41 ANN. REV. OF PUB. HEALTH 329 (2020), <https://www.annualreviews.org/doi/10.1146/annurev-publhealth-040119-094035>.

⁴⁷ *Id.* (citing HEALTH EFFECTS INST., STATE OF GLOBAL AIR/2018, <https://www.stateofglobalair.org/sites/default/files/soga-2018-report.pdf>).

⁴⁸ *State of the Air: Key Findings*, AMERICAN LUNG ASS'N, <https://www.lung.org/research/sota/key-findings> (last visited Jan. 28, 2022).

⁴⁹ Press Release, American Lung Association, More Than 4 in 10 Americans Breathe Unhealthy Air, People of Color 3 Times as Likely to Live in Most Polluted Places (Apr. 21, 2021), <https://www.lung.org/media/press-releases/sota-2021>.

⁵⁰ STEER, ECONOMIC IMPACTS OF AUTONOMOUS DELIVERY SERVICES IN THE U.S. XV (2020), https://www.steergroup.com/sites/default/files/2020-09/200910_%20Nuro_Final_Report_Public.pdf.

⁵¹ Alan Adler, *Embark Knits BYD Electric Trucks with its Autonomous Tractors for Cleaner Air*, MODERN SHIPPER (Sept. 14, 2021), <https://www.freightwaves.com/news/embark-knits-byd-electric-trucks-with-its-autonomous-tractors-for-cleaner-air>.

⁵² Ryan Gehm, *Self-driving trucks cut fuel consumption by 10%*, SAE INTERNATIONAL (Dec. 19, 2019), <https://www.sae.org/news/2019/12/tusimple-autonomous-trucks-cut-fuel>.

⁵³ ECONOMY PARTNERS, FOREFRONT: SECURING PITTSBURGH'S BREAK-OUT POSITION IN AUTONOMOUS MOBILE SYSTEMS ES-1-2 (2021), <https://ridc.org/wp-content/uploads/2021/10/PGH-Autonomy-Report-Executive-Summary.pdf>.

1. Job Expansion in the AV Industry

The AV industry is creating jobs and providing opportunities for workers with a wide array of expertise and educational backgrounds, including many jobs that do not require a college degree. Today, in locations across the country, AV developers and manufacturers are hiring auto technicians, fleet managers, safety operations specialists, sensor calibrators, transportation planners, engineers, and many others to support the testing and deployment of AV technology. Additionally, as the industry continues to expand, delivery workers, and grocery store employees will be involved in selecting, packing, and delivering goods to consumers, among other jobs and roles that will emerge. AVs can expand access to affordable delivery while also creating over three million new jobs by 2035, as retailers and delivery providers expand their services, according to a study by Steer.

In addition, the AV industry is investing in partnerships to create the jobs of the future. For example, Nuro's program with De Anza Community College will offer a new career pathway to prepare the next generation of autonomous fleet technicians.⁵⁴ The initiative, which will include more locations in the near future, includes a free tuition option, access to paid internships and part time work, and preference for full time jobs and full benefits upon graduation. Another example is TuSimple's work with Pima Community College, which established an AV certificate program to prepare drivers for new jobs such as training AV systems as test drivers, operating the AV in situations where autonomous driving is not suitable, and remotely monitoring the system from a command center.⁵⁵

2. Consumer Savings

AVs can reduce the costs of consumer goods as well as transportation. To highlight one example, AVs have the potential to significantly reduce the cost of deliveries for consumers, with some pilots costing only \$5.95 per grocery delivery, compared to the added costs of between \$10 and \$20 charged by existing delivery services.⁵⁶ With respect to transportation costs—which amount to the second-largest expense for most households⁵⁷—AVs could reduce average household costs by as much as \$5,600 per year when consumers rely on shared fleets of AVs.⁵⁸ This would be particularly impactful in food deserts, rural communities, and other areas that do not yet have significant, accessible public transit options.

3. Economic Benefits of AV Trucking

In the coming years, autonomous trucking will fundamentally alter interstate commerce by changing the manner and speed in which goods move in our country while making roads safer for everyone, AV trucks can increase long-haul efficiency and capacity, which will in turn improve the efficiency of countless industries that rely on moving goods on trucks, such as agriculture, retail, and manufacturing. Importantly, AV trucks will be part of a comprehensive trucking ecosystem that works with human drivers, not against them. Adoption of this technology will not lead to mass layoffs; it will lead to a positive lifestyle change for thousands of truckers, allowing them to stay closer to home during the day instead of driving routes that keep them on the road for weeks at a time. Our members' technology will allow drivers to spend more nights in their own beds instead of in the sleeper berth of a truck. That's a change we believe will be welcomed by many truckers.

A recent study funded by USDOT and the Federal Highway Administration also indicated that adoption of AV trucking will increase total U.S. employment by 26,400 to 35,100 jobs per year on average and raise annual earnings for all U.S. workers by between \$203 and \$267 per worker per year.⁵⁹ Given the timeline for AV truck deployment, autonomous trucking is not likely to cause significant displacement of jobs in the trucking industry,⁶⁰ but it can serve as one tool to reduce

⁵⁴ *Autonomous and Electric Vehicle Technician Pathway*, DE ANZA COLLEGE, <https://www.deanza.edu/autotech/av#:~:text=A%20New%20Career%20Pathway%20With,nation%20%E2%80%94%20for%20De%20Anza%20students> (last visited Jan. 28, 2022).

⁵⁵ Linda Baker, *TuSimple and Pima Community College Launch First-Ever AV Certificate Program for Truck Drivers*, FREIGHT WAVES (June 13, 2019), <https://www.freightwaves.com/news/tusimple-and-pima-community-college-launch-first-ever-av-certificate-program-for-truck-drivers>.

⁵⁶ STEER, *supra* note 49 at XI.

⁵⁷ *Fostering Economic Opportunity through Autonomous Vehicle Technology*, SAFE (Jul 16, 2020) <https://secureenergy.org/fostering-economic-opportunity-through-autonomous-vehicle-technology-2/>.

⁵⁸ *Id.*

⁵⁹ ROBERT WASCHIK ET AL., JOHN A. VOLPE NAT'L TRANSP. SYS. CTR., *MACROECONOMIC IMPACTS OF AUTOMATED DRIVING SYSTEMS IN LONG-HAUL TRUCKING* (2021), <https://rosap.ntl.bts.gov/view/dot/54596>.

⁶⁰ See SECURING AM. FUTURE ENERGY, AMERICA'S WORKFORCE AND THE SELF-DRIVING FUTURE REALIZING PRODUCTIVITY GAINS AND SPURRING ECONOMIC GROWTH (June 2018), <https://>

strains on the supply chain caused, in part, by the longstanding truck driver shortage.

AV trucking also holds substantial potential to decrease the cost of goods. Sixty-five percent of U.S. consumable goods are brought to market by trucks, and the implementation of full autonomy in the trucking sector stands to decrease operating costs by about 45%—resulting in savings between \$85 billion and \$125 billion.⁶¹ The benefits to our nation’s economy, workers, and supply chains make AV trucking well positioned to complement the broader array of economic benefits that AV deployment will bring.

II. U.S. LEADERSHIP IN AV DEVELOPMENT SHOULD NOT BE TAKEN FOR GRANTED

The United States is leading the world in the development and deployment of AV technology, but the U.S. risks losing our technological and automotive leadership in a global market worth an estimated \$8 trillion⁶² due to foreign competition. America’s leadership role is integral to securing the economic growth, job creation and many safety and societal benefits offered by AVs. However, as explained below, foreign competitors are moving to surpass our progress through policy changes and government investment.

China. China’s government is investing heavily in developing autonomous vehicles as part of its strategy to overtake and replace foreign market leaders. The Chinese government has prioritized AV development and included AVs in the Made in China 2025 strategic initiative, which encourages local governments to open roads for testing.⁶³ One company, AutoX, backed by e-commerce giant Alibaba, announced the launch of autonomous taxis on public roads across an area three times the size of Manhattan within Shenzhen in January 2021.⁶⁴ In 2020, Apollo Go, backed by China’s leading search engine Baidu, was authorized to launch a pilot of the first paid AV taxi (or “robotaxi”) service in Beijing,⁶⁵ and has also begun public tests in Shanghai.⁶⁶ Many other Chinese companies are investing in AV technology and testing, including Huawei, Pony.ai, WeRide.ai, Didi Chuxing, and Momenta. These companies are also attracting investment from other countries around the world. However, Chinese companies recognize that American talent and investment is a key to competing with the U.S. for leadership in the AV industry.

Singapore. Singapore is ranked #1 in the world in regard to AV readiness⁶⁷ and has launched an autonomous commuter bus available to residents for a small fee.⁶⁸ The government of Singapore has also opened over 620 square miles of road for AV testing, and has set a target of having AV bus service to three new towns by the end of 2022.⁶⁹

Germany. Germany passed a law in 2021 that amended the national road traffic law to create an approval framework for L4+ capable vehicles.⁷⁰ Mobileye is already

avworkforce.secureenergy.org/wp-content/uploads/2018/06/Americas-Workforce-and-the-Self-Driving-Future-Realizing-Productivity-Gains-and-Spurring-Economic-Growth.pdf.

⁶¹ AISHA CHOTTANI, ET AL., MCKINSEY & CO., DISTRACTION OR DISRUPTION? AUTONOMOUS TRUCKS GAIN GROUND IN US LOGISTICS (Dec. 10, 2018), <https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/distraction-or-disruption-autonomous-trucks-gain-ground-in-us-logistics>.

⁶² Michael Wayland, *GM’s Cruise Values Autonomous Vehicle Industry at \$8 Trillion*, CNBC (Feb. 5, 2020), <https://www.cnbc.com/2020/02/05/gms-cruise-values-autonomous-vehicle-industry-at-8-trillion.html>. The estimate includes ride-hailing, trucking, data services, and telematics/infotainment.

⁶³ Michael Dunne, *China Races for Global Leadership in AVs*, AXIOS (Oct. 27, 2018), <https://www.axios.com/china-races-for-global-leadership-in-autonomous-vehicles-6a3a8059-d170-47e6-87d5-fbb6fa8e738b.html>.

⁶⁴ Rita Liao, *China’s Robotaxis Charged Ahead in 2021*, TECHCRUNCH (Jan. 14, 2022), <https://techcrunch.com/2022/01/14/2021-robotaxi-china/>.

⁶⁵ *Id.*

⁶⁶ Rebecca Bellan, *Chinese Tech giant Baidu Begins Publicly Testing Apollo Go Robotaxis in Shanghai*, TECHCRUNCH (Sept. 14, 2021), <https://techcrunch.com/2021/09/13/chinese-tech-giant-baidu-begins-publicly-testing-apollo-go-robotaxis-in-shanghai/>.

⁶⁷ KPMG INTERNATIONAL, 2020 AUTONOMOUS VEHICLES READINESS INDEX 12 (2020), <https://home.kpmg/xx/en/home/insights/2020/06/autonomous-vehicles-readiness-index.html>.

⁶⁸ Eileen Yu, *First Commercial Autonomous Bus Services Hit Singapore Roads*, ZDNET (Jan. 25, 2021), <https://www.zdnet.com/article/first-commercial-autonomous-bus-services-hit-singapore-roads/>.

⁶⁹ KPMG INTERNATIONAL *supra* note 66 at 12.

⁷⁰ Jack Ewing, *How Germany Hopes to Get the Edge in Driverless Technology*, N.Y. TIMES (July 14, 2021), <https://www.nytimes.com/2021/07/14/business/germany-autonomous-driving-new-law.html>.

testing vehicles in Munich,⁷¹ and in 2021, Argo AI and Volkswagen announced they would commence on-road testing in Germany with an intended launch date for AV commercial delivery and micro-transit services in 2025.⁷²

United Kingdom. In 2021, the United Kingdom (“UK”) legalized automated lane keeping systems (SAE Level 3), and on January 26, 2022, the Law Commission of England and Wales, along with the Scottish Law Commission released a joint report recommending new laws to regulate AVs in Great Britain.⁷³ The UK government also touted a report last year that AVs could generate £41.7 billion and 40,000 skilled jobs by 2035 for the UK, and the country has invested £200 million into British AV startups.⁷⁴ AV testing is already underway across the country with backing from the UK government, universities, technology companies, and research institutions.

France. The French Council of Ministers passed an ordinance on April 14, 2021 amending the French road traffic law to allow L4+ deployment.⁷⁵ Late last year, the French government also approved a Level 4 AV shuttle to carry passengers on public roads.⁷⁶ Further, France has indicated it will implement its own L4+ type approval requirements by September 2022, if the EU has not done so already.

Japan. Japan enacted a Road Transport Vehicle law in 2020 recognizing AVs and establishing an inspection regime and permit system.⁷⁷

Other Countries. Other countries, including the Netherlands, Norway, Finland, South Korea and the United Arab Emirates, also continue to make significant strides to incorporate AVs into the transportation landscape.

The American automobile and technology industries will continue to develop, test, and eventually deploy AVs. However, as other foreign governments move forward, and in some cases give a leg up to their own domestic industries, the U.S. risks ceding its leadership position and market opportunity. To guard against this outcome, the U.S. should adopt a national policy framework that unlocks more opportunities for American companies to test and deploy AVs safely.

III. NATIONAL FRAMEWORK

In order to advance toward a future that maximizes the benefits of AV technology, both the AV industry and policymakers will need to work together to establish a national framework for the safe and swift deployment of AVs. In the section below, we outline the core elements of such a framework: (a) enhancing public trust in safety, and (b) maximizing the deployment of safe AV technology with clear federal and state roles.

A. Enhance Public Trust in AV Safety

As with any new technology, the AV industry understands that many people have questions about how AVs work and how they affect local communities. To answer these questions, the industry will continue to take steps to educate the public about the safety of AV systems. Autonomous Vehicle Industry Association member companies that are engaged in AV testing and development have joined or will join NHTSA’s voluntary “Automated Vehicle Transparency and Engagement for Safe Testing Initiative” (“AV TEST Initiative”) to provide the public with direct and easy access to information about testing of automated driving system-equipped vehicles. Participation in the AV TEST Initiative will increase the public awareness of on-road testing, safety precautions, and principles guiding the testing. Our members

⁷¹ Kyle Hyatt, *Intel’s Mobileye Goes for an Autonomous Spin Around Munich*, CNET: ROADSHOW (Dec. 15, 2020), <https://www.cnet.com/roadshow/news/mobileye-self-driving-munich-demonstration/>.

⁷² Andrew Hawkins, *VW Will Start Testing its Argo AI-powered Self-driving Vans in Germany this Summer*, THE VERGE (May 12, 2021), <https://www.theverge.com/2021/5/12/22430813/vw-argo-autonomous-delivery-ride-pooling-germany>.

⁷³ LAW COMM’N OF ENGLAND AND WALES & SCOTTISH LAW COMM’N, AUTOMATED VEHICLES: SUMMARY OF JOINT REPORT (2022), <https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jxou24uy7q/uploads/2022/01/AV-Summary-25-01-22-1.pdf>.

⁷⁴ *UK on the Cusp of a Transport Revolution, as Self-driving Vehicles Set to be Worth Nearly £42 billion by 2035*, GOV.UK (Jan. 13, 2021), <https://www.gov.uk/government/news/uk-on-the-cusp-of-a-transport-revolution-as-self-driving-vehicles-set-to-be-worth-nearly-42-billion-by-2035>.

⁷⁵ Johnna Crider, *France is Preparing for the Arrival of Autonomous Driving*, CLEANTECHNICA (July 4, 2021), <https://cleantechnica.com/2021/07/04/france-is-preparing-for-the-arrival-of-autonomous-driving/>.

⁷⁶ David Rogers, *Europe’s First Fully Autonomous Vehicle to Carry People in Toulouse*, GLOBAL CONSTRUCTION REV. (Nov. 29, 2021), <https://www.globalconstructionreview.com/europes-first-fully-autonomous-vehicle-to-carry-people-in-toulouse/>.

⁷⁷ Kazuhiro Ogawa, *Japan Revamps Laws to put Self-driving Cars on Roads*, NIKKEIASIA (Mar. 9, 2019), <https://asia.nikkei.com/Politics/Japan-revamps-laws-to-put-self-driving-cars-on-roads>.

that are engaged in AV testing and development also are publishing, and updating as necessary and appropriate, safety evaluation reports that contain detailed information meant to educate the public and NHTSA about the SAE Level 4 technology being tested or deployed. Other initiatives that the industry is taking include working with public safety officials to educate them about how to interact with AVs with no human driver present in the vehicle and supporting increased funding for NHTSA to reinforce the role that the agency is playing to support the safe deployment of AV technology and to help ensure that the agency is able to resolve rulemakings and exemption petitions in a timely fashion.

B. Maximize Deployment of Safe AV Technology

The industry's work to enhance public trust in AV safety goes hand in hand with a policy framework that is optimized to bring the swift deployment of AV technology to the public. Below, we identify the core elements of such a framework:

- i. Preserving traditional state roles in vehicle operation licensing, registration, inspection, and insurance, and the federal government's exclusive authority over vehicle safety performance.
- ii. Preserving the traditional federal role in vehicle operation, licensing, inspection, repair, and maintenance for commercial vehicles transporting property or passengers in interstate commerce.
- iii. Lifting vehicle exemption caps and creating predictable processing timelines.
- iv. Completing a rulemaking or series of rulemakings on removing barriers to the deployment of AV technology.
- v. Expanding eligibility for the test exemption in the FAST Act to level the playing field among all stakeholders in the AV and automated driving system development ecosystem.
- vi. Clarifying that practices to avoid rider interference with conventional driver controls during autonomous operation do not fall within NHTSA's interpretation of the "make inoperative provision."
- vii. Ensuring that no government policy, legislation, or regulation should require people who are unable to obtain a driver's license to obtain a license to be a passenger in an AV. People without a driver's license should not be precluded from obtaining the mobility benefits of this technology.

IV. CONCLUSION

We face a safety crisis on our roads caused in large part by human behavior. AV deployment will make our roads safer, and can improve transportation equity, freight efficiency, and economic growth. As other countries take steps to realize these benefits, the U.S. should not take its leadership position for granted. Through a national framework that enhances consumer trust and maximizes AV deployment, we can seize this momentous opportunity. I want to thank the Subcommittee for its leadership on these important issues. The Autonomous Vehicle Industry Association looks forward to serving as a resource concerning both technical and policy questions and working with you to make safe autonomous vehicles a reality for Americans nationwide. I look forward to answering any questions that you may have.

Ms. NORTON. Thank you very much, Mr. Wolf.

I now record recognize the chair of the full committee, Mr. DeFazio.

Mr. DEFazio. Thank you, Madam Chair. Thanks to all the witnesses for the testimony. This is a very important hearing, and the committee needs to be focused more on these issues.

I would like to address one particular concern. Pretty much all of the discussion in Congress has been about the technology, the vehicles themselves. I think there has been very little discussion of the current state of our infrastructure and whether or not it is suitable, and, if not, what sort of measures do we need to implement in order to have vehicles safely deployed throughout the whole United States? Would anyone like to comment on that?

Ms. CASTEX-TATUM. Thank you for that question, Chair DeFazio.

Many of the autonomous vehicle companies have stated that the infrastructure needed is not different from the current infrastructure of drivers today. We can all benefit from improved roads,

fewer potholes, and better lines. But the information that we have received in Houston is that these vehicles will operate with the infrastructure that we currently have in our cities.

Mr. DEFAZIO. Yes, but, I mean, some of them are dependent on camera—I mean, they use different ways of navigating.

And if anybody else would like to comment, because I am concerned that when many States don't put state of good repair at the top of their list, that there are many roads that don't have adequate fog lines, that don't have good markings and other things that many of these vehicles are dependent upon to range more widely. Anyone want to comment on that?

Mr. BEUSE. Yes, Mr. Chair, I can comment on that. I think, being in a city that just experienced a pretty horrific bridge collapse—and thank goodness that there were no fatalities—the point that you raised is really, really important to understand around maintenance of the current infrastructure.

While I completely agree with what Ms. Tatum was saying, there are normal things that make driving as human beings good, and those are good for self-driving vehicles. But to your point, everybody has sometimes a different approach. And so, when we talk about this issue, I think it is really more about what can we do to make the current environment safer. So, whether that be striping, whether that be making sure road signs are there, whether that be even equipping current-day vehicles with different technologies, all of those things together, actually, will help the deployment of AVs, as opposed to where we treat them now as sort of these very discrete and different issues.

Mr. DEFAZIO. Great. Thank you. Anybody else?

Ms. CHASE. Mr. Chair, yes. Mr. Chair, Cathy Chase.

I agree with some of the points that you already astutely pointed out, in terms of improvements that need to be made both for vehicles now, as well as vehicles of the future, especially as our population is aging. Signage needs to be improved. Different lines of sighting need to be improved for autonomous vehicles.

I also am thinking about a few years ago, when the Senate Environment and Public Works Committee held a hearing on infrastructure and autonomous vehicles, and then-head of the New York City Department of Transportation, now Deputy Secretary of Transportation, Polly Trottenberg, said something to the effect of: New York City is never going to have a perfect infrastructure; these vehicles better be ready to pretty much deal with what they are going to come upon. And we agree with that. And that is why we are pushing so hard for these minimum standards, like a vision test, so that when a car or truck takes over the responsibility of seeing, that we know that the vehicle itself will actually see and respond to what is happening.

So, I think we need a holistic approach, where the infrastructure needs to be improved both now—because people are holding on to cars for approximately 12 years—and vehicles of the future. And all of this can be accomplished. Thank you.

Mr. DEFAZIO. OK, thank you. I want to—

VOICE. Mr. Chair?

Mr. DEFAZIO [continuing]. Quickly make another point, because this is very important.

Tomorrow we are holding a hearing on 5G. The FCC created issues, the way it was deployed. But we also saw that the FCC has proposed selling more than half of the vehicle-to-vehicle communication spectrum.

Mr. Marler, you referenced this. Can you just comment on how abysmally stupid that is?

Mr. MARLER. Thank you, Mr. Chair. I would be happy to offer a few perspectives from the State DOTs. And to link it to the previous question about infrastructure, we all want good pavement condition.

We all think that lane markings and clear signage are very important. These will help drivers today and the CAVs tomorrow. But the digital infrastructure is just as important to enable the future transportation systems. We are talking about communications, we are talking about data standards, we are talking about digital mapping.

So, with specific regard to connectivity, we believe that the safety promise of the CAVs will be enhanced through connectivity. So, preserving the 5.9 gigahertz safety band, this would add certainty, not only for State and local jurisdictions, but also for developers and manufacturers, and we do see that as a key component of any future automated transportation system.

Mr. DEFazio. OK, thank you.

Thank you, Madam Chair. My time has expired.

Ms. NORTON. Thank you, Mr. DeFazio. I now recognize Mr. Crawford for 5 minutes.

Mr. CRAWFORD. Thank you, Madam Chair. I appreciate that.

I would note that this hearing was originally scheduled for 10 a.m. I don't know how many people this change inconvenienced, but I would hope that we could, at the very least, maintain a schedule.

And further, perhaps if we held hearings more frequently, we wouldn't need to jam eight witnesses into a single panel. At the very least it is unwieldy, but it also does a disservice to both witnesses and members of this committee by constraining meaningful dialogue.

Let me say this. I want to direct a question to Catherine Chase.

In your written testimony to the committee in November on challenges to the supply chain, you responded to the argument that many of my colleagues and myself made that, if 18 is old enough to put your life on the line and drive a convoy into battle, then it is old enough to make a living as a commercial truckdriver. Your testimony dismissed that idea. Not only did you miss the point of the argument, but you minimized the hard work and sacrifice of young men and women in uniform with an offensive political cartoon depicting seven sailors operating one compact car, including one sleeping in the back, presumably because it is such an easy task.

Ms. Chase, would you consider manning military vehicles an easy job?

Ms. CHASE. No, sir.

Mr. CRAWFORD. Thank you. If 18 is old enough to die for your country, is it not old enough to choose to make an honest living as a truckdriver?

Ms. CHASE. Well, I would like to first address a comment that you made——

Mr. CRAWFORD. That is a yes or no question, ma'am. That is a yes or no question.

Ms. CHASE. I——

Mr. CRAWFORD. Is 18 old enough to die for your country—can they also drive a truck?

Ms. CHASE. They are not comparable questions. It is an apples to oranges.

Mr. CRAWFORD. They are. That is an absolute yes or no question. And you are taking a position that, as a military veteran, I find offensive, and many of the Members on this panel who are military veterans find offensive.

Not only did you make that comment, but you included this [indicating a "Broadside" cartoon], which is already in the record, but I will ask unanimous consent to enter it into this record.

Ms. NORTON. So ordered.

[The information follows:]



“Broadside” Cartoon by Jeff Bacon, Included in a Letter From Catherine Chase, President, Advocates for Highway and Auto Safety, Published in the November 17, 2021, Committee on Transportation and Infrastructure Hearing Transcript Entitled, “Industry and Labor Perspectives: A Further Look at North American Supply Chain Challenges,” Submitted for the Record by Hon. Eric A. “Rick” Crawford



Mr. CRAWFORD. I find that highly offensive, as a veteran, and I think most veterans would, that your position is that we are either incompetent and/or lazy and not well trained.

So, I am asking you again, this is a yes or no question, if 18 years old is old enough to die for your country, shouldn't they be old enough to make a living driving a truck?

Ms. CHASE. Sir, the point of the—

Mr. CRAWFORD. Yes or no, and then I will go on to my other witnesses.

Ms. CHASE. It is very difficult—

Mr. CRAWFORD. Yes or no, and I will go on to my other witnesses.

Ms. CHASE. Please go on to your other witnesses.

Mr. CRAWFORD. So, you have no answer to that question? We know how you feel about it, based on the cartoon you entered in the record earlier in your testimony.

Ms. CHASE. I am trying—

Mr. CRAWFORD. OK, I will move on. I will move on to Mr. Ariel Wolf and Mr. Nat Beuse.

We certainly, in my district, like many other districts, a lot of truckdrivers out there—and I know how vital trucks have been to the American economy, especially during the COVID pandemic and our recent supply chain crisis. Can you talk about how you envision higher levels of automation, making truck-driving jobs safer, and what impacts that will have, in terms of efficiencies on automated trucking and productivity?

Mr. WOLF. Congressman, I am happy to take that question, and thank you for it.

I think the place to start is the well-documented and long-standing truckdriver shortage that is having an impact on the economy as we speak, and the supply chain. And that issue, in concert with the U.S. Department of Transportation study that showed a net increase of jobs, as many as 35,000 per year, in addition to other economic benefits, leads us to the conclusion it really is time to shift the way we think about the conversation around jobs and autonomous trucks. These are two areas that can complement each other in this ecosystem.

And as that technology moves forward, I would just also say it is a matter of safety as a baseline matter, because as we have talked about the safety statistics worsening over time, 14 percent of fatal crashes, serious crashes, involve heavy trucks. So, getting this technology deployed is essential in that respect.

And on the jobs front, we certainly see, overall, an increase in jobs, economic growth. And as I noted in testimony, as the ecosystem grows, there are a number of different roles and new kinds of jobs that are going to be created in this exciting area.

So, I think, all of that taken together, we see a lot of positive activity going forward.

Mr. CRAWFORD. Thank you. Mr. Beuse?

Mr. BEUSE. Congressman, thank you for the question. I think I will mention two things.

Part of the challenge we have with this space is the lumping of all the technologies together, and we call them all automated. Certainly, there are technologies in the pipeline, some already on vehicles today on commercial trucks, that make the driving task easier for human drivers.

And then there is technology like that we are working on, which is really around the driving task, which could make the driving trucking jobs different in the future.

So, it is not about some sort of replacement thing. And that is exactly why we are doing this pilot with FedEx, is so that we can learn all of these different issues beyond just: does the tech work? It is actually: how do we introduce this technology into the existing system in a way that is—and frankly—seamless, right? We don't want to introduce additional friction into a system that already has a bunch of friction in it.

Mr. CRAWFORD. Thank you, and I yield back.

Ms. NORTON. Thank you very much. I recognize myself for 5 minutes.

Mr. Samuelsen, your testimony makes a strong case for ensuring workforce needs are addressed as deployment of commercial AVs becomes more prevalent. I share your concerns that, if left unchecked, automated vehicles may create tremendous hardship for commercial motor vehicle drivers.

So, my question is, what steps can Congress and the Federal Government take to harness the safety benefits of automated trucks and buses, while at the same time supporting a stable, well-paid surface transportation workforce?

And do you believe that addressing commercial driver workforce needs and employing AV technology are mutually exclusive goals, or can both be attained?

Mr. Samuelsen?

Mr. SAMUELSEN. Thank you for the question.

So, we have a situation now where there are waves of technology coming into public transport—buses, for instance, the operation of buses—that require an absolute robust Federal regulatory framework for them to be deployed safely. And I think the first thing that needs to be done is that there needs to be a Federal check that anything that goes on to highways, roads in America, meet a regulatory minimum that is set forth by the Federal Government.

And the second piece of that is, I have listened to some of these questions back and forth about automated technology and impact on the workforce. I think that the impact on the workforce has the chance to be extreme. Right now, there are, despite discussion about automating technology being introduced for safety reasons, for many other reasons, there are transit systems and operators across the country right now that are embracing this technology simply for the purpose of reducing headcount. And that is absolutely true.

We deal with transit employees across the country, public-sector operators that are looking to reduce budgets, and private-sector operators that are looking to maximize profit, and all doing this without any regard for the future safety of highways or roads. And I think that the only intervener there that can prevent this from happening in a chaotic way is the Federal Government.

And in terms of the use of automated technology simultaneously with human operators, I think that is the way to go to utilize automated technology, augmenting and assisting humans operating vehicles, particularly in public transit. There is no working American that believes that replacing buses with automation is a good thing for working people who use public transit in America. Nobody believes it.

And also, this notion that the introduction of automation is going to somehow create new jobs, we have heard all of this with NAFTA. We have heard it many, many times with NAFTA, with normalization of trade with China, that somehow the introduction of automated technology that could replace human operators is going to produce more jobs. We have heard that, we have seen that movie already, and have absolutely no trust or faith in this technology coming in in a positive way, unless the Federal Government steps up and regulates. Thank you.

Ms. NORTON. Thank you very much, Mr. Samuelsen.

Mr. Beuse and Mr. Wolf, the last time the subcommittee held a hearing on this topic was in 2013. That is going on 10 years ago. And at that time, AVs were still considered a technology of the future. But today there are at least 1,400 AVs, including automatic commercial vehicles, being tested on U.S. roadways in 36 different States.

What do you think is a realistic timeline for deployment of your technology, specifically vehicles with Level 4 automation and above, and when can Americans expect to see these vehicles driving on the roads next to them?

Mr. WOLF. Madam Chair, I am happy to jump in, and then defer to my colleague on the panel here.

I think that, as a baseline matter, we see this technology on the roads today, as you noted. One of the most important things to see this technology scale—and again, it is, as Mr. Beuse noted, being used in pilot projects carrying freight, and helping to alleviate the supply chain crisis that we face, as well as other instances where the technology—and one example in Arizona: providing meals to individuals that live in food deserts is just another example.

But to scale this technology, the timeline is somewhat dependent on building a national framework that will accomplish two things: one is to enhance consumer trust in the technology, but then two is to maximize deployment.

And in my written testimony I note a number of different steps that we are eager to continue to work with this committee—and we are thankful for the work thus far in other committees in Congress and stakeholders—to develop a national framework that will maximize the deployment of this technology so that we can start to see those benefits that we have talked about a number of times accrue to the public.

Ms. NORTON. My time has expired, and I go next to Mr. Bost.

Mr. BOST. Thank you, Madam Chair. Before I go on to my questions that I have prepared, I would like to associate myself with the comments that Representative Crawford made, because, as a member on this committee—probably the only one that actually had my license for a tractor-trailer when I was 16, was driving when I was 18, and by the time I turned 19, I was in the Marine Corps. All of those things I was very capable of handling, and handling safely. My family believed in me. The State of Illinois actually tested me out and, by golly, guess what? I passed that driver's test at 16 years old, never had a car license, only had a tractor-trailer license.

At a time when the United States is needing people to be available to work, wise decisions based on the individual, not discriminating against them because of their age, would probably be a lot wiser thing to do than to have cute cartoons about where we are at right now, and what we are needing.

That being said, Mr. Wolf, the development and deployment of automated trucks is already raising a question for truckdrivers about what the future of their profession would look like. Many are wondering how their work will change, and what new skills they will need.

To help us kind of understand what the future would look like for drivers, could you describe the level of standardization between

the various AVs, as far as trucks, and their technologies that are being developed by different manufacturers?

For example, if a trucker is trained to operate one of the trucks that Aurora has developed, would their skills be easily transferable to the drivers of a different manufactured truck or technology?

And would the driver need to have separate or additional training? Do we know that?

Mr. WOLF. Thank you, Congressman, for the question. I am happy to address it.

I think maybe the place to start is to understand that there are two different kinds of technologies here, and the Autonomous Vehicle Industry Association, we are working with, of course, autonomous vehicle technology, which is so-called full automation, where the technology is not designed nor is it expected for a human to be involved in the driving task. That is distinct from driver assistance technology, which many of us have seen: lane-keep assist, adaptive cruise control. And others have described it. And that technology, there is an expectation for a licensed human operator or driver to take back control, or to be vigilant at all times to take control. So, those two are very different kinds of technologies, and I think that distinction is critical, because oftentimes it can be conflated.

So, in that respect, I can't speak to the expectation to licensed human drivers in the driver assistance context, and the technology in that sphere. But in the autonomous vehicle side, again, the expectation is that there would not be a driver to take back control. For the time being, there are safety operators and monitors involved there, and I would defer to individual members of our association to speak to the transferability of those skills.

Mr. BOST. I understand. I appreciate that answer.

Mr. Samuelsen, well-trained mechanics are essential for keeping our trucks and buses safe and on the road. What additional training needs will there be for mechanics, for having automated systems?

Are there additional safety concerns for workers around the automated trains or buses?

And what can we do to make sure that the maintenance workers are prepared for these type of vehicles, once they start in operation?

Mr. SAMUELSEN. Yes, thank you for the question. So, workforce development forced by Federal intervention, Federal regulatory requirements, is of the utmost importance with the advent of these latest waves of technology coming in, and AV technology and electric buses closely related.

And if that is a model going forward of what we could potentially expect, electric buses, which seem like such a great idea in terms of greening the environment, greening urban America, have had the unintended consequence of a massive, massive negative impact on workers, particularly bus mechanics. So, we anticipate a 30- to 40-percent reduction in bus mechanics that would be necessary when the bus fleets across America are fully electric. or fully zero emissions. Without the combustion engine, it is just a lot less maintenance required.

So, what we see is a necessity for workforce development, a necessity by the Federal Government to ensure that our current me-

chanics on diesel buses are able to make the transition to work on the new fleet, and that systems and the trade union movement are able to work collectively to figure out how the existing workforce—how the negative effects can be mitigated as best available. So, the Federal Government is extremely valuable in this. They are going to be the guide here.

And again, a regulatory framework and with workforce development requirements is vital. Thank you.

Mr. BOST. Thank you.

My time has expired. Madam Chair, I yield back.

Ms. NORTON. I recognize next Ms. Johnson of Texas.

Ms. JOHNSON OF TEXAS. Thank you very much, Madam Chair, and thank you for holding this hearing. I have a question for Mr. Bloch, but I will do a part of my statement first.

Over the last 3 years, the Dallas-Fort Worth area has become one of our Nation's central testing grounds for AV trucking technology. And two companies, Kodiak Robotics and Waymo, have opened operational hubs in my district. And another company, Aurora, expanded into the Dallas-Fort Worth area in June of 2020, bringing high-quality, high-tech jobs to many of my constituents.

Indeed, this wave of investment is due in large part to the leadership and close coordination demonstrated by Dallas College, which is our community college network; the North Central Texas Council of Governments; the Dallas Regional Chamber; the Texas Department of Transportation; and the Texas Department of Public Safety. Dallas College has been a leader in creating workforce development in our community college district, focused on the future of transportation, in part fueled by \$1½ million granted from COG to develop a curriculum for AV and transportation tech jobs.

However, although AV technology has the potential to provide many societal benefits, serious questions remain. Like many of my colleagues, I am concerned about the issues related to safety, and want to make sure that a strong Federal safety framework is enacted and adhered to in the industry.

Additionally, as we move forward, I believe that the Congress and AV industry should incorporate labor priorities, and address the workforce needs by including policies aimed at mitigating both job losses and any potential wage decreases.

And lastly, I urge the AV industry to invest in the creation of high-quality jobs for those who may face displacement.

Now we have a large traffic in trade. And this was simply a way to try to keep things moving. I noticed that most people are worried about the jobs, and we are too, except that we have such a small number of drivers for the traffic we have.

So, Mr. Bloch, I want to thank you for highlighting a provision that I fought to include in the INVEST Act regarding workforce retraining. As you can imagine, I was more than disappointed that the Senate deleted that language from the final bill. Would you be able to expand on what kinds of programs you would like to see when you mention workforce retraining programs for surface transportation workers whose jobs have been affected by automation?

Now, I have the largest Teamsters local in the country in my district, so, I would like you to respond to that, if you will.

Mr. BLOCH. Thank you very much for the question. I am thinking about legislation we are introducing in the California State Legislature, in the public transit arena, that will make it a subject of collective bargaining when AV technology is introduced in the public transit arena. And I think the important thing is that impacted workers get notice of new technology before it is introduced, and have a chance to respond and have a voice.

Now, I gave some examples out of the canneries, where canneries were closed, and workers were thrown out there at the mercy of workforce development, and it did not work well for them. So, I do think it is important to get ahead of this, and I appreciate the efforts that are happening in your district.

Here, we represent 800 workers at a bus company called Gillig. They are the highest paid manufacturing workers in the United States. They make buses that Mr. Samuelson's members drive. And we are doing a partnership with Gillig with workforce development funding from the State of California to train workers to work on zero-emission vehicle buses.

We really do think there are win-win scenarios out here, where we can leverage Federal and State money to train workers for the jobs of the future. But again, the important thing here is that, at least in California, when employers get money, there are strong labor standards attached to that: prevailing wages, minimum wages, so that we make sure that the workers that we are training actually stick around and get retained in their work.

Ms. JOHNSON OF TEXAS. Thank you very much. I am out of time, but I ask unanimous consent to put the rest of my questions in the record for attention, and the rest of my statement.

Thank you, Madam Chair, and I yield back.

Ms. NORTON. So ordered.

[The prepared statement of Ms. Johnson of Texas follows:]

**Prepared Statement of Hon. Eddie Bernice Johnson, a Representative in
Congress from the State of Texas**

Thank you, Chairman DeFazio, Highways and Transit Subcommittee Chairwoman Norton and Ranking Member Davis for holding today's hearing. I would also like to thank our outstanding witnesses for testifying before us today.

Right before the holidays last December I took my staff to tour Kodiak Robotics' AV facility at the Dallas Inland Port, located in my congressional district. Seeing first-hand the technology being developed at this facility was truly impressive.

In fact, over the last three years the Dallas-Fort Worth area has become one of our nation's central testing grounds for AV trucking technology. And two companies—Kodiak Robotics and Waymo—have opened operations hubs in my district, and another company, Aurora, expanded into the Dallas-Ft. Worth area in June 2020, bringing high-quality, high-tech jobs to many of my constituents.

Indeed, this wave of investment is due in large part to the leadership and close coordination demonstrated by Dallas College, the North Central Texas Council of Governments, the Dallas Regional Chamber, the Texas Department of Transportation, and the Texas Department of Public Safety. Dallas College has been a leader in creating workforce development programs focused on the future of transportation, in part fueled by a \$1.5 million grant from the COG to develop a curriculum for AV and transportation tech jobs, and through this grant, Dallas College has been partnering with the growing industry throughout the Dallas-Ft. Worth area.

However, although AV technology has the potential to provide many societal benefits, serious questions remain. Like many of my colleagues, I am concerned about issues related to safety, and want to make sure that a strong federal safety framework is enacted and adhered to by the industry. Additionally, as we move forward,

I believe that Congress and the AV industry should incorporate labor priorities and address workforce needs by including policies aimed at mitigating both job losses and any potential wage decreases. Lastly, I urge leaders in the AV industry to invest in the creation of high-quality jobs for those that may face displacement by this emerging technology.

Ms. NORTON. Mr. Stauber, I recognize Mr. Stauber.

Mr. STAUBER. Thank you. Thank you all for being here today, and I think we have all learned a lot about the industry and about this technology already during this hearing.

I will preface this with saying that I think that Congress needs to get this right, and I think there is a happy medium between letting tech companies rule our streets and applying over-restrictive Government regulations on the industry.

My first question has to do with the actual technology used in the AVs. As technology progresses, I have no doubt that we will see more of these vehicles throughout the country, not just in cities or in areas where there are company-specific engineers to make repairs to vehicles. We have already seen with some manufacturers that they are limiting who can actually do work on their vehicles.

I can tell you that I trust my local mechanic a lot more than someone who needs to fly out to my hometown of northern Minnesota from Silicon Valley to do the repairs. And Mr. Garamendi, this should not be offensive to you.

I just want to know, Mr. Wolf or Beuse, how are companies looking at these types of issues as we move into the future?

Mr. BEUSE. Thank you, Congressman, for the question. I will take a shot at it, and then I will pass it over to Ariel to talk about just kind of what we are doing at this stage.

So, obviously, we are still in the testing phase, and getting kind of really focused on the path to shipping a product. One of the things we are learning in all of that is exactly the questions you are asking about, so, how do we think about maintenance, the schedule of those, what that really looks like.

I think a key point to reference here is the fact that the technology that we are developing is really more of in a business-to-business relationship. So, think about a FedEx or Walmart or an Amazon who has their own fleet of vehicles, who is maintaining that fleet of vehicles for the operations that they are conducting, versus the point you excellently made about you or I in our personal vehicle needing to get a repair at the local repair shop where we choose to go.

I think, again, this is where we and our principals are very supportive of Congress actually doing more on commissioning any studies on jobs, and that they really be around the quality of those jobs, because they are going to be slightly different than I think what we envision today.

Mr. STAUBER. OK, thank you.

And Mr. Wolf?

Mr. WOLF. Thank you, sir. I may just add in response to that question that the autonomous vehicle industry is a diverse industry with respect to use cases and applications.

And so, in thinking about those important issues you raised, there is, of course, personal vehicle ownership, there is deployment in a fleet model, there is autonomous trucking, and then there is

last-mile autonomous delivery services. In a sense, it is not one size fits all. There may be different conversations in each of those use cases as those businesses start to continue to scale up and bring benefits to the American society.

Mr. STAUBER. And Mr. Wolf, this is the next question. Additionally, I also recognize that increased automation introduces new risk factors for folks that we do not understand yet, such as sensor, camera, or software problems. Because of this, diagnosing damage to a vehicle, determining liability, and completion of police reports will increasingly rely on the data that the vehicle generates before, during, and after an accident.

Mr. Wolf, what do the companies you represent—what are they doing to ensure that relevant entities will have access to this critical data, and that it is timely, complete, and useful?

Mr. WOLF. Well, thank you for the question, Congressman.

In that respect, the autonomous vehicle industry and companies that are developing and operating this technology are engaging in information sharing in a number of ways. Let me just spell out a couple here.

All of these companies are responding to a NHTSA order with respect to incidents involving autonomous vehicles.

The developers and manufacturers also are participating in a voluntary initiative with the National Highway Traffic Safety Administration to provide information about the location of testing and the parameters of that testing.

Members also have released safety self assessments that examine the safety of the technology and provide information in that respect.

And so, I think, for those reasons and other reasons, there are a number of ways that these companies are providing data and information, and I look forward to having the conversation going forward in other ways, as well.

Mr. STAUBER. OK, my last question real quick for Mr. Samuelsen.

The human component of our public transit operators are really valuable, and great members of our community. In, for instance, in a bus or one of the transit commuters, we have seen examples where there is violence happening. Can you please speak to some of these incidents, and how are we going to look at them going forward on AVs?

Mr. SAMUELSEN. Yes, so, I mean, the violence is prevalent. There is a full-moon type atmosphere going on right now across passenger transportation. But it has been a glaring problem in urban transportation, urban transit, buses, and subways for decades.

Actually, the uniformed bus operator is the single greatest deterrent to crime taking place against riders in the systems. And I think a really big problem with the potential of humanless operation in public transit is the crime that riders would be exposed to absent a uniformed presence of a bus operator. I think it is super important to contemplate that, going forward.

I myself was on a B78 bus in Brooklyn many times, mugged during high school and saved by the intervention of a uniformed bus operator.

So, I hope that answers your question. I think it does.

Mr. STAUBER. It does. Thank you very much.

Madam Chair, I yield back.

Ms. NORTON. I recognize next Mr. Garamendi.

Mr. GARAMENDI. Madam Chair, thank you very much, very good hearing.

Mr. Stauber, thank you for your questions. I was going down the same line here. My questions really go to, first, Ms. Chase.

The gathering of information. It seems to me that one of the things that we must do immediately is to make sure that information on all accidents, as well as the machines and the technology, be readily available. Could you please respond to that? Is information available? What do we need to do to make sure that it is on reporting on all accidents?

Ms. CHASE. Thank you for the question, Congressman. As was recently just mentioned, there is a standing general order by the National Highway Traffic Safety Administration which requires companies that are producing vehicles of SAE Level 2 and higher to submit information regarding crashes.

However, we have not seen that information, so, we don't know what is happening on our roadways, and it is very critical that the National Highway Traffic Safety Administration share this, so that the public and consumers are informed when they are on the roads, when they are buying new cars, what they can trust.

And I would just like to comment also on the compliance with the voluntary safety agreements, or the AV TEST Initiative. None of these are regulatory or required. They are all voluntary, meaning a company can decide to submit some tests, some information, choose what information they want to submit, or walk away at any point. And that is why these minimum performance requirements are so essential. A framework or voluntary agreements is not going to do the trick. We need to know what is happening on our roads, and the way to accomplish safety is through regulation.

Mr. GARAMENDI. Very good. That also applies to the insurance industry. And that was, I am sure, one of the issues that was brought to us earlier today.

Mr. Samuelsen and Mr. Bloch, representing the men and women that are on these trucks and vehicles, how do you envision a regulatory environment or scheme in which your workers would be protected, and the transit operators and people that are on those vehicles would also be protected? What do we need to do to create a regulatory environment?

Mr. SAMUELSEN. So, if I may, the main thing here is to understand that we have seen advanced technology introduced into public transit several times before. In my 30 years here, this is about the third or fourth significant wave of technology coming in. And the technology can be used to enhance service delivery, safety, state of good repair, while simultaneously benefiting workers.

And that is what a regulatory framework from the Federal Government should emphasize, that all of these can work synergistically together to produce a really good outcome for riders and transit systems and workers, where no worker gets left behind and no rider gets endangered. Thank you.

Mr. GARAMENDI. Thank you.

Mr. Bloch?

Mr. BLOCH. Yes. Thank you, Mr. Garamendi.

So, we all know our friendly neighborhood UPS driver, and our members—we have 325,000 working for UPS, it is the largest collective bargaining agreement in the country—drive trucks that have driver-assistive technologies like automated braking systems, lane controls, telematics, mapping and routing software, and algorithms that all make our jobs safer and better.

So, like Mr. Samuelsen, we are not afraid of technology and we benefit from it. However, in response to your question, I think it is very important, as others have mentioned, that the Federal Government set the floor for the regulation of technology, and not the ceiling.

I am fortunate enough to live in a State like California, where a lot of this technology is being developed, and we have policymakers that are going above and beyond to protect both workers and the general public, and not to stop this technology, but to ideally develop it in a way that benefits workers and the public and industry. So, thank you.

Mr. GARAMENDI. I thank you for that. It seems to me that we have a necessity to set at least a couple of standards here: one, that information from crashes and the technology be readily available, not only to the Government, but also to the insurance industry, as well as to the committee, so that we can then develop legislation; secondly, the training programs that have been discussed here must also be in place.

Fortunately and unfortunately, this committee wrote a very good bill on surface transportation. Unfortunately, much of the training programs that were in that bill did not find their way into the Infrastructure Investment and Jobs Act, so, we have to repurpose and get that back in.

With that, I yield back.

Ms. NORTON. The gentleman yields. I ask next Mr. Burchett for your questions.

Mr. BURCHETT. Thank you, Chairlady. Thank you all for being here. I will make a statement first that has absolutely nothing to do with my questions, but I think one of the folks in labor said something about NAFTA, and how they were promised jobs, and how that just turned out to be a joke. I think it might have been Mr. Samuelsen.

And if you think these AV jobs are going to come to you, I think you probably are mistaken in that, because the only thing we seem to do up here very well is run up debt, and you are either at the table or on the menu. And I think American workers are currently on the menu when a lot of this stuff comes down. So, I hope you all are paying very close attention to that.

But my question is for Mr. Beuse regarding the FedEx ground pilots with Aurora.

What safety data is Aurora collecting, and how will that be used to improve the safety of AVs, more broadly?

Mr. BEUSE. Congressman, thank you for the question. This is a really great example of something I mentioned in my testimony about our safety case framework.

So, our safety case framework is a holistic approach to safety, where we are not looking at just the product, but also our oper-

ations, as well as our organization. And so, in this way, this is how we are addressing safety, even before those vehicles are on the road with autonomy.

As we get closer to actually releasing the product without vehicle operators, then all of those different principles that we have—and there are five—that we need to fulfill within that.

So, the FedEx pilot is really learning more about the operational aspects of what we are trying to do, as opposed to how we are engineering the product. And certainly, there are some things that we are actively looking at, particularly with respect to maintenance, as I mentioned before. But really, the safety of the product is really handled by our safety case framework.

Mr. BURCHETT. OK, thank you. I was county mayor, and I remembered hearing some testimony about it, and just out of the—I think the educational level on this is lacking out in the communities because a lot of folks thought that some of this would be controlled, community to community. But in reality, it has got to be an entire network. It can't be one county to one county or one State to one State, because we know those borders are not followed, especially when traveling. But the automotive vehicle legislation, of course, it has been in limbo for at least half a decade.

And what do you think is going to be needed in the short and the long term to make sure that the automated vehicle technology can be safely deployed?

And also, I wondered—and in my mind I hear a lot of folks talking about how AV, is somebody going to have the master switch and going to be able to turn it off, to where, if somebody steps afoul of the law, or some other reason, that they can literally shut that down. I wonder what your thoughts on that are, Mr. Beuse.

Mr. BEUSE. Thanks again, Congressman, for the question. Yes, I completely agree with your points around a jurisdiction-to-jurisdiction approach. That is certainly not workable for an efficient rollout of the technology, nor is it workable to actually realize that—even the potential, right? Like, that is a framework that just doesn't work, and it is a framework that we have never used for motor vehicle equipment in the United States.

I think, with respect to what is needed, I think it is some of the things that bear mentioning here.

So, one is NHTSA and DOT have already outlined a number of rulemakings. Some are started, some they planned as part of what Secretary Buttigieg put out late last week. And we need those to continue, and we need those to continue with some urgency.

I think one of the themes that I keep hearing in this panel is we are pitting safety against innovation, and I don't know why we are doing that. We are literally in a crisis of fatalities on our Nation's roadways. We really need all of these tools on the table, including autonomous vehicles. And so, all of those rulemakings are helpful, whether they apply to lower levels of automation or whether they apply to what we are doing.

I think the second thing we need is really for Congress to show and demonstrate some leadership with all of us stakeholders around developing laws and regulations that are technology and business neutral. I still hear a lot of commentary that seems very specific to a very particular application. In some cases, even a par-

ticular manufacturer, which, again, is not how we have developed and rolled out technology in the United States.

And then the third thing is really with respect to the jobs question. No doubt there are issues that we need to study and understand. But that doesn't mean we should not take action. Again, the status quo is not great. That should not be our goal. Our goal should be: what are all the tools that we need to use in order to see this technology really advance.

Mr. BURCHETT. Thank you, Chairlady. That is all my time. Thank you so much, ma'am.

Ms. NORTON. Thank you.

Mr. BURCHETT. Thank you, sir.

Ms. NORTON. We hear next from Mr. Johnson of Georgia.

Mr. JOHNSON OF GEORGIA. Thank you, Madam Chair, for holding this very important hearing, and thank you, witnesses, for your testimony.

The Georgia Institute of Technology released a study in March of 2019 that exposed the algorithmic bias embedded in machine learning and the technology behind self-driving cars. Researchers found that people with darker skin are more likely to be struck by an autonomous vehicle than a person with fair skin, because models are programmed by people who do not consider every complexion a person can have.

Mr. Beuse, what measures can be taken to root out racial bias at the onset of newly developed AV technology?

And what, if anything, is holding back industry from taking those steps?

Mr. BEUSE. Thank you, Congressman Johnson, for that question. Pretty important, as we sit here in the beginning of Black History Month, as well.

I think what I would say is it is not necessarily about the folks writing the software. Part of what we are doing is training autonomy based on what it sees. And so, it really is more of the environment that it is in, as opposed to someone actually programming something malicious in the code.

There is a lot of talk in the industry about how do we go about making sure that those biases aren't in the algorithms as we get closer to deployment. And I know some researchers have put some studies out there, but I think this is one that is worth maybe a deeper conversation around just how all of this is fitting together, and certainly how deeply Aurora thinks about this particular issue.

Mr. JOHNSON OF GEORGIA. Thank you, sir. As AVs increase in numbers, they will need to talk to one another and their surroundings. This will result in the need for supportive infrastructure, not to mention cybersecurity and privacy safeguards for the exponential growth in data.

Mr. Wolf, what regulatory measures are needed to prevent against cybersecurity attacks and to ensure the privacy of Americans' data?

Mr. WOLF. Congressman Johnson, thank you so much for the question.

The autonomous vehicle industry has some of the world's top engineers working to build AVs. And in that context, cybersecurity efforts are part of the engineering and design process from the start,

at all levels of development. So, that is a very good aspect there, not just for the development, but for the testing and eventual deployment.

Now, in the 21st century, of course, cybersecurity is critical every single day for the AV industry. But it is not confined to the AV industry, of course. It is not just for the rest of the automotive industry, but all sectors of the economy, writ large. So, we support, as an industry, a robust and risk-based policy approach that recognizes that cyber threats are dynamic and constantly evolving, and would be happy to work with this committee and other stakeholders to develop that approach.

Mr. JOHNSON OF GEORGIA. Thank you. How should Federal agencies ensure that our wireless infrastructure can handle the data needs that AVs require, without causing interference with existing systems such as what we have seen with 5G and the aviation industry?

Mr. Wolf?

Mr. WOLF. Thank you, Congressman. Now I want to make sure I answer the question directly. I think there are maybe two things.

One is, if it is on the issue of spectrum, and the use of connected vehicle technology, of course, the industry welcomes investments in that respect. But autonomous vehicles are being developed, tested, and deployed so as to not have to rely on connected vehicle technology, but again, of course, welcomes investments in infrastructure that enables those functionalities.

With respect to the data handling on the Federal side, I may have to defer to others on the panel who can better answer it, or just respond to you in writing on that. But I am happy to do so.

Mr. JOHNSON OF GEORGIA. Thank you. The statistic that 94 percent of traffic crashes are caused by human error is widespread, even though it is erroneous. In fact, numerous structural issues play a role in traffic crashes, including the distance between crosswalks and the roadway, the width of a lane as the speed limit changes, and the presence or absence of bike lanes. So, the idea that self-driving cars are the solution misses the bigger picture.

What is more, Tesla recently developed a self-driving model that includes an assertive driving feature so that the car will not fully stop at stop signs. Mr. Wolf, what justification is there for developing a program that allows vehicles to violate State and local laws?

Mr. WOLF. Well, I appreciate the question, Congressman. And the simple answer is: Tesla is not a member of our association because it is not an autonomous vehicle. It is a driver assistance technology.

Autonomous vehicles are developed from the start to comply with all Federal and State and local laws as just one component of the safety assurance systems that are put into these technologies. Other examples, as you raise, are just—they deal with other technologies—again, driver assistance—that just don't relate to it.

And I would maybe just say one additional note very quickly on the statistic you noted. Whether or not it is a specific, exact number, DOT, the U.S. Department of Transportation, just last week reaffirmed in its National Roadway Safety Strategy that the overwhelming majority of serious and fatal crashes involve at least one

human behavior issue as a contributing factor. And that is the key point.

And the autonomous vehicle industry fundamentally, and first and foremost, exists to address that safety failure that is contributing to the crisis on our roadways and in addition to many other solutions and strategies that are outlined in that paper. And as you noted, Congressman, we are hopeful, and look forward to getting this technology widely deployed to solve that problem.

Mr. JOHNSON OF GEORGIA. Thank you.

Ms. NORTON. Thank you very much, and I recognize Mr. Guest for 5 minutes.

Mr. GUEST. Thank you, Madam Chairman. I want to first thank all of our witnesses for educating us on the challenges that lie ahead for automated vehicles.

Mr. Beuse, I want to talk to you just a few moments. In your testimony you talk about the importance of safety and trust as being an important key mission. You actually say there in your written testimony—on page 3 you say, “Safety is at the core of everything we do at Aurora. It shapes who we hire, how we work, and how we develop our products.”

I see later, on page 4, you talk about Aurora’s safety case framework, which was published in August of last year, and which you describe as the first AV safety case framework that applies to both autonomous trucks and passenger vehicles.

And then you go on to talk a little bit more indepth about safety. One of the things that I found was particularly helpful was the fact that you say no single piece of evidence captures the totality of safety, and then you go on to list five safety principles. Those principles that you list in your report were proficient, fail-safe, continuously improving, resilient, and trustworthiness.

And so, I would ask if you would take a few minutes to expand first on each of these principles, and then to explain how these principles are applied to automated vehicles.

Mr. BEUSE. Thank you, Congressman, for the question. Yes, I am a safety guy, so safety appears a lot when I talk. It means a lot to me.

One of the things that I think maybe help to explain how this all fits together is kind of taking a step back and talking about the Aurora Driver as a technology versus Aurora Driver being inserted, let’s say, into one of our platform partners like PACCAR or Volvo or Toyota.

So, in order to do those partnerships, we have to have deep relationships with those vehicle manufacturers who are very good at building vehicles. And what we are doing is putting together the best of the best. So, we are very good at building hardware and software that can do the driving task, and they are very good at building vehicles that are used today and for the foreseeable future.

And so, when we think about the safety, it is the safety of that whole package together. And so, these five principles are how we engineer and design the Aurora Driver in concert with those vehicle manufacturers.

And so, let me talk about proficiency, for example. So, proficiency is really around how we put the right behavioral competencies in

the vehicle. Do we actually understand what those mean? Do we understand the environment that we are operating in? Do we have tests and requirements, and so on and so forth.

When you look at the principle of fail-safe, that is really around: is the vehicle safe in the presence of all faults and failures. So, Chairman DeFazio mentioned, like, the camera goes out, right? That is something that we have to understand, and we have to understand how that relates so that the vehicle always ends up in a safe spot—or lidar, or whatever the case may be.

When you think about continuous improving, so, this is where we are always learning. I think one of the challenges that we have in the industry right now is the assumption is that you do it once, and then it is done forever. Well, that is not the case with automated vehicles. There is a continuous improving part of it that we are always going to input the lessons learned, and put them back into the vehicle.

Resilient is where we sort of really focus on things like software and how the vehicle can be misused. These are all things that we have to think through as we design the Aurora Driver to be used in commerce.

And the last one is really around trustworthy. That is really with, first and foremost, our regulators. That is also with members of the public. And then that is also with our partners. We have to build a product that is safe for them to actually be able to trust it and actually use it in their course of business.

And so, those five principles together, we believe, encompass the whole framework of safety that is needed to deploy these vehicles safely.

Mr. GUEST. And is this something that could be expanded industrywide, so, it is not something just unique to Aurora itself, but these same principles would be something that would be important to anyone who would be in this industry? Is that correct?

Mr. BEUSE. Yes, Congressman, it is. We have been openly sharing our framework. And in fact, I would note that I was in DC about 2 weeks ago for the SAE Government/Industry Meeting, and there were some of our competitors openly talking about the use of safety case and some of the things that they consider.

Mr. GUEST. Thank you very much.

Madam Chairman, at this time I yield back.

Ms. NORTON. Thank you very much, Mr. Guest. I next call on Ms. Brownley for 5 minutes.

Ms. BROWNLEY. Thank you, Madam Chair. I really do appreciate you holding this hearing today, and I am sure this is going to be one of many, many hearings on autonomous vehicles, certainly, as the technology progresses on this.

So, I think always safety has to be first. I think everybody agrees on that. And as Mr. Samuelsen noted in his testimony, he said over-reliance on automation can be deadly. We certainly saw that on this committee with a 737 MAX and the 2009 Red Line Metro crash in DC. So, in my opinion, we are going to continue to need highly skilled drivers for transit vehicles and trucks.

So, Mr. Samuelsen, speaking further on safety, you also noted in your testimony that there are 9.1 self-driving car accidents per million miles driven versus 4.1 per million miles among regular vehi-

cles. This is, to me, a startling statistic, since many proponents of AVs argue that the technology will improve safety. Why do you think there is such a disconnect between the real statistics and the rhetoric?

Mr. SAMUELSEN. Well, first of all, I think that the introduction of automated operation into public transit is just so new, it is so absolutely new, it is not even here yet, in reality. There are tests going on into big city public transit systems in America. So, the rhetoric is going to accompany the introduction, because it is new, and nobody has ever seen it before.

But absolutely, the statistics that are being put forth, we just saw kind of dueling statistics right now, with how many accidents there were per 100,000, and whether or not those accidents are based on human error or based on traffic design, and that type of thing.

So, I don't think I am answering your question quite well.

Ms. BROWNLEY. Well, I appreciate your attempt at it, and I just think it is an important distinction to make as we move forward with this. We want to move forward based on the science and the facts, and not by rhetoric.

Ms. Chase, do you have anything to add?

Ms. CHASE. I do, thank you, Congresswoman. I think that the lack of minimum performance standards and the confusion right now about what technologies can and can't do, and human over-reliance upon some of the technologies—not to beat up on Tesla, I don't mean to do that at all, but when a company calls a system auto driver, autopilot, or full self-driving, it really communicates a message that that is what it is going to do.

And I think that while Aurora and other companies might be, as Nat said, tapping the best of the best, that is not happening throughout the industry. And that is why the Federal Government needs to step in, and we need our regulators to do their jobs with that assurance to the Federal Government. Then we will see all types of crashes reduced.

Ms. BROWNLEY. Thanks for that, and that leads me, actually, to another question for Mr. Wolf. And this is really more about public education.

There seems to be some misunderstanding among the general public regarding the level of autonomy that some vehicles offer. For instance, I am sure we have all seen the viral videos of people sleeping behind the wheel, or sitting in the back seat of vehicles which are not fully autonomous. And then there have been some high-profile crashes that raise concerns that consumers do not fully understand the necessary level of driver engagement required to operate vehicles that are considered Level 2 vehicles.

So, my question is, what is the Autonomous Vehicle Industry Association doing to educate consumers about the significant differences between Level 2 and Level 4 or 5 autonomy?

And what additional steps do you think are needed in this area?

Mr. WOLF. Congresswoman, thank you so much for that question, because it speaks to a very important safety issue that is at play today.

Autonomous vehicles are distinct and different from driver assist technology. And that conflation, as you outlined, ma'am, that

conflation is having, really, a twofold impact. One is, it is dangerous, because it is leading consumers to believe that lower levels of automation and technology are, in fact, actual autonomous vehicles, and over-reliance on that. And then second, it is having an impact on consumer trust in the autonomous vehicle industry, which is problematic because of the very positive safety benefits that will accrue to society if we get that technology deployed. So, it has a twofold impact, as well as other things.

Now, the industry is absolutely committed to trying to brighten this line, delineate this as clearly as possible, and has undertaken some initiatives on consumer education. There are a number of educational initiatives. I am trying to work on terminology, standardizing terminology, so that consumers can understand that.

So, in a number of different ways, we are laser-focused on trying to get this distinction—essentially, decoupling this—because what we are concerned about, in addition to what I mentioned, is in some respects in the conversation, leveraging these high-profile failures of driver assist technology, and having that impugn or disparage the autonomous vehicle industry, which has a very strong safety record going on more than 10 years and, again, will solve a number of safety problems that are driven by human behavioral issues in the statistics.

So, I am happy to follow up with you more on that and explore ways to try and brighten that line.

Ms. BROWNLEY. Well, thank you for that. My time is way over. I yield back, Madam Chair.

Ms. NORTON. I next call on Mr. Fitzpatrick for 5 minutes.

Mr. FITZPATRICK. Thank you, Madam Chair, and thanks to all of our panelists for being here, for all of your work. We do appreciate your expertise. I want to start with Mr. Samuelson.

Sir, good to see you. I wanted to talk a little bit about AVs. DOT recently issued a new set of innovation principles for transportation. These principles make it clear that innovation investment should be in service of creating high-quality jobs. Do you believe that Congress should adopt this approach to overseeing new technologies like AVs, as well?

If so, do you expect this approach to improve the lives of your members in your union?

Mr. SAMUELSEN. Yes, so, thank you for the question.

Absolutely, Congress should follow the lead that the DOT set out. Innovation investment can be an absolute win-win-win across the board in public transit. It could be a win for the workforce, in terms of ensuring that good jobs are protected and, when good jobs are created, that they are solid, union jobs. It can also enhance service delivery, enhance state of good repair, enhance the overall transit rider experience.

So, that type of innovation investment is exactly what we are looking at. And with a regulatory framework in place that bears in mind the impact on workers, our members will likely greatly benefit from much of this technology.

Mr. FITZPATRICK. I appreciate that. Moreover, I want to expand on that topic.

Since about 2016, DOT has taken steps to having a regulatory framework for AVs. If Congress were to move forward this year

with an AV bill, what TWU provisions benefiting your union would you like to see in there?

The AV bill this Congress could tell us what kind of provisions would ensure that labor has a seat at the table.

Mr. SAMUELSEN. Yes. So, we would want to see a bill that put an emphasis on rider safety, worker safety, workforce development, and an absolute assurance that we don't revisit mistakes of the past that workers are displaced by technology in the same way that they would be displaced by a mass exportation of jobs. All of this can be achieved with Federal Government intervention.

That piece of legislation would be incredibly helpful to workers, and I fear, without a piece of legislation that accomplishes what I just laid out, that workers will be severely negatively impacted, going forward.

Mr. FITZPATRICK. Thank you, Mr. Samuelsen. Next up, Mr. Wolf.

The FAA has extensive experience with autopilot technologies, going back to its founding. More recently, it has dealt with AVs. Some AVs even have ambitions to be multimodal and serve as surface and air taxis. Sir, from your industry perspective, has there been adequate cross-agency collaboration between NHTSA, FMCSA, and the FAA?

Mr. WOLF. Thank you, Congressman, for the question. I can't speak to what conversations have taken place between the modes at DOT, whether between NHTSA and FAA and so forth.

What I can say is that the autonomous vehicle industry and the engineers, and scientists, and all of the folks who are working to develop that technology, I know are open to learning from all different analogies and other technologies to make this technology as safe as possible.

I would note that, of course, there are some key and important differences: 270 million-plus vehicles registered in the United States, and our approach does take a human driver approach to how those operate, and licensing. And so, all of us get behind the wheel.

And as I noted a couple of times, it bears reiterating that the U.S. Department of Transportation has reaffirmed just last week that it remains the case that the overwhelming majority of serious and fatal crashes involve at least one human behavioral issue as a contributing factor.

So, in that respect, it becomes very important for the autonomous vehicle industry to scale and deploy, so, it can work to remove those human behavioral issues that contribute to these tragedies on our roads. And if we can get that technology out, and scale it as quickly and safely as possible, in conjunction with many other safety approaches that may apply in the cross-modal context, as you noted, Congressman, then we can start to see a reversal of the terrible trend regarding fatalities and injuries on our roads.

Mr. FITZPATRICK. Do you believe that there should be a new agency, whose sole mission it would be to oversee new transportation technologies such as AVs?

Mr. WOLF. Well, Congressman, I would say that, as we look right now, as my copanelist, Nat Beuse, has mentioned, there are a number of regulatory instruments and rulemakings that are underway at both NHTSA and the Federal Motor Carrier Safety Administra-

tion that will help address the national framework that we need to get this technology to scale.

So, at the moment we are looking at those rulemakings and advancing them as quickly as possible, in conjunction with congressional action that will also—with some of the measures I enumerated in my written testimony—help the industry scale, and build out, and bring those benefits to the public.

Ms. NORTON. Thank you very much.

Mr. FITZPATRICK. I yield back.

Ms. NORTON. We will next hear from Mr. Lowenthal.

Mr. LOWENTHAL. Thank you, Madam Chair, and thank you to all of our witnesses. I think what we have heard are the tremendous opportunities and challenges of the autonomous vehicle technology that it presents to us.

And Mr. Bloch and Mr. Samuelsen, I want to hear from your perspective how these technologies impact a part of our supply chain which often gets overlooked, and that is—and frequently—and I will get to it—is really the disenfranchised part of our supply chain.

I represent the Port of Long Beach, and I am also the cochair of the PORTS Caucus. Drayage truckers face some of the most challenging working conditions in an extremely competitive industry. And frequently, drayage drivers are misclassified, I believe. They are misclassified as independent contractors. And what that means is frequently it leaves them in a cycle of poverty, without the benefits of employment, without the benefits of potential unionization.

And so, the question that I have is, when we are dealing with those that are the most disadvantaged now, the most impacted, how do we facilitate the deployment of AV technologies to take advantage of their potential to improve working conditions for existing drivers, such as the driver assistance technologies to improve operator safety and job quality, while also mitigating the risk of job loss or displacement, when we are really talking about those that are already disenfranchised, the members of the trucking workforce?

Do you have any thoughts about how this is going to impact those that are the most disenfranchised today?

Mr. BLOCH. Well, Mr. Lowenthal, I appreciate the question, and I appreciate all the work that we have been able to do with you during your time as a Representative in California to improve the working conditions for truckdrivers at all of our California ports.

We did a study with a researcher named Steve Viscelli out of the University of Pennsylvania a few years ago, looking at how automation was going to roll out in trucking. And the scenario that he projected, after talking to industry experts, was that a lot of the long-haul trucking is poised to take advantage of this technology, from platooning to semi-autonomous to fully autonomous vehicles.

But when you get into urban areas, such as Long Beach and L.A., it is very hard to imagine drayage trucking, or short-haul trucking, or even less-than-truckload trucks fully automated, doing that work.

So, the scenario we saw was hubs being set up outside urban areas where these transfers could happen. And our concern, unchecked, is that we could have hubs outside of urban areas all over

the United States that operate under the same model that happens at our ports, which you are describing, which is hiring workers as independent contractors, instead of employees, making them buy the trucks, making them liable for everything, and, essentially, them making less than minimum wage after they pay all their expenses, which has led to huge turnover in the workforce, and gets back to my earlier point about the supply chain problems are not really a training and recruitment problem, but a worker retention problem that is tied to actually making sure that drivers make decent wages and benefits so they can stay in their jobs.

I hope that answers your question.

Mr. LOWENTHAL. Yes, thank you.

Mr. Samuelsen, do you have anything to add? That was a very complete answer.

Mr. SAMUELSEN. Yes—and thank you for the opportunity—only that in your comments leading up to the actual question you spoke about innovation technology working synergistically with truck-drivers. And I think that is the ultimate goal here. That should be everybody's ultimate goal, to utilize technology to make transportation, either passenger transportation or otherwise, as safe as it possibly can be.

We all know that automation fails. We have seen automation fail. There has been testimony and answers to questions about how safe it is. But all we have to do is look back at the 737 MAX incident, where in, one fell swoop, a computer overrode the decision of a pilot and crashed, killing several hundred people, more than once.

I am not suggesting that that is imminent, but it is that type of thing that a human operator would stop. And this type of technology, again, working hand in hand with a human operator, is an ideal that we should be pursuing. Thank you.

Mr. LOWENTHAL. Thank you, and I yield back.

Ms. NORTON. Thank you. And I recognize Mr. Johnson of South Dakota.

Mr. JOHNSON OF SOUTH DAKOTA. Thank you, Madam Chair. I appreciate it, and my conversation will be with Mr. Marler.

And I liked the fact that you called out the fact that, although our rural areas only hold 19 percent of our population, it is 68 percent of our Nation's lane-miles and 45 percent of our fatal crashes. And so, I am coming from a rural State. Of course, I care a great deal.

And I thought Chair DeFazio asked a really good question earlier to one of the other witnesses about the effectiveness of these automated vehicles really depends a lot—autonomous vehicles, rather—depends a lot on the quality of the roads. And so, you mentioned this automated shuttle service that was operating on all different kinds of rural roads, including gravel and unmarked roads. And so, maybe tell us a little bit more about that. Maybe tell us how you would have answered Chair DeFazio's question.

Mr. MARLER. Well, thank you for that question.

Rural roads and the operations of autonomous vehicles on rural roads is certainly on the minds of many of our States, because many of our populations are rural in nature. And as you pointed

out, the rural areas have—45 percent of all fatalities are on rural roads. So, this absolutely is a concern.

So, one of the things that we focus on in Iowa is our physical infrastructure across the board needs to be in good condition: better pavements and bridges, our lane markings, our signage, our shoulders. We know that good stewardship of our physical infrastructure helps to enable automated vehicles of the future.

But we are also looking at the digital infrastructure, and that is getting at the demonstration project that you mentioned. The University of Iowa actually received a Federal grant to look at the operation of rural shuttle buses in rural parts of Iowa, and these buses are operating on gravel roads and unmarked roads, very rural scenarios in the State of Iowa, because we are trying to make sure that we are able to serve all of our populations across the State.

And so, one of the things that is very important for this shuttle bus to work is the digital infrastructure and, more specifically, the high-definition mapping that is on board. That map is able to digitally paint a center line down a gravel road. And this is very key for the operation of this particular rural shuttle.

Now, that is one thing that we are learning, and there are many learnings that we are experiencing, but I would say that there is work yet to do here, and we need to ensure that the benefits are going to be widespread.

I will mention one other thing that will tie into this directly is the expansion of broadband across our States and across our Nation. In Iowa this has been a very important focus for us, and we, just in the last 12 months, as a matter—we have invested \$323 million in broadband grants for the private sector to install more broadband.

Mr. JOHNSON OF SOUTH DAKOTA. So, as we work on this demonstration project, as the University of Iowa works on this demonstration project, what appears to be the biggest challenge?

I mean, logistically, what is going to be the largest hurdle to clear?

Mr. MARLER. Logistically, is standards across the board. Basically, this project is helping us understand the data standards that we need, but we are building that through this demonstration project: what are those minimum standards across our Nation that we need to look at for data; what are those minimum standards for connectivity?

This is one reason we talk about preserving the 5.9 gigahertz space, is we need to be able to rely on some of the communication technologies, as well as those minimum data standards that make the distribution of the technologies ubiquitous everywhere in our country.

Mr. JOHNSON OF SOUTH DAKOTA. Is the demonstration project—tell me more about if they are analyzing to what extent these things are scalable.

Setting aside the broadband, because I think you are right, the digital infrastructure is critically important. But what about all of the other things?

You talk about upgrading the quality of the roads. That is a pretty substantial undertaking, as well. Is a demonstration project very scalable?

Mr. MARLER. Well, we think it will be. And keep in mind, we are learning a lot with this. But the reason we think it is scalable is because these lessons that we are learning, we are trying to look at it more from an agnostic point of view with the technology, and just saying, what are those basic things that we need in these rural areas?

And that is why I mentioned earlier the broadband perspective. It is because—

Mr. JOHNSON OF SOUTH DAKOTA. Sure.

Mr. MARLER [continuing]. We know—

Mr. JOHNSON OF SOUTH DAKOTA. One more thing, quickly. What would come next?

Let's say that the demonstration project is a big success. What does phase 2 look like?

Mr. MARLER. So, phase 2 is we are trying to understand, operationally, what we can do, as transportation departments, to help the situation with rural automation. What can we do, from an infrastructure and an investment perspective, to set that stage such that it can really, as you say, be scalable and go to the next level?

So, it is really our operations focus is what comes next, as we analyze the data.

Mr. JOHNSON OF SOUTH DAKOTA. Thank you, sir.

Thank you, Madam Chair, for your indulgence. I yield back.

Ms. NORTON. Thank you. Next, Mr. García for 5 minutes.

Mr. GARCÍA OF ILLINOIS. Thank you, Chair Norton and Chairman DeFazio, for holding this important hearing on automated vehicles.

As automation becomes more common across all our transportation modes, including public transit, we must proactively ensure that we are placing workers first, and that we are upholding the highest safety standards. We can do this by including workers in the decisionmaking on how automation is deployed and making sure that they are given knowledge to use the new technologies.

My questions. To Mr. Samuelsen, in your testimony you mentioned how the AV framework needs to focus foremost on upholding the highest safety standards, and on creation of good jobs. As you mentioned, we can do this by giving workers a seat at the table so that they can help shape innovation. Employers who automate jobs, including transit agencies, usually know that they will eliminate positions years ahead of time.

Is this information generally shared with workers in a timely manner?

And if not, should the Federal Government require companies that use automated technology to give workers advance notice on these kinds of procurements?

Mr. SAMUELSEN. Yes, absolutely, and thank you for the question.

Certainly, there is very little notice given, in general, to workers or representatives of workers, workers unions, very little notice. And it would be common for a worker or the union to find out that there is going to be technology displacing human jobs when a pink slip arrives. That would not be uncommon at all.

Mr. GARCÍA OF ILLINOIS. And how best can we bring workers to the table when it comes to deploying innovation?

Is it fair to say that making sure workers learn about these kinds of events far enough in advance to find other employment or to retrain in the use of new technology is the first step?

Mr. SAMUELSEN. Yes, absolutely. In cities in America, where workers have the power to compel that to happen, it has happened. But in the overwhelming majority of transit cities across the country, that does not exist.

So, the Federal Government stepping up and compelling transit employees or municipalities and State governments to give as much advance notice as possible, as a requirement, would be ultra helpful. And in fact, it would enhance labor peace in the long run. It would give the unions and the employees a chance to work together to identify jobs that workers who are potentially facing displacement could land in. And that is what this should all be about.

Mr. GARCÍA OF ILLINOIS. Thank you.

Mr. Bloch, from a Teamsters perspective, how can you bring workers to the table when it comes to innovation, so that we are putting workers first?

Mr. BLOCH. I appreciate the question, and would echo the comments of Mr. Samuelson.

When new technology comes to the workplace, and workers have the ability to join together in unions, then they can sit across the table from their employer and bargain about it. As I mentioned, we are introducing legislation in California to make the introduction of autonomous vehicles in the public transit sphere, where we also represent a lot of drivers, a mandatory subject of collective bargaining. We are going into bargaining with United Parcel Service this year, as I mentioned, the largest collective bargaining agreement in the country. And you better believe we are going to be bargaining around technology.

Our experience has been that new technology can help make our jobs safer and make us more productive. But, as you have said, sir, to have those discussions on the front end allows us to be proactive and adapt.

Mr. GARCÍA OF ILLINOIS. Great.

Mr. BLOCH. And for workers that don't have unions, they just have to take whatever they get from the boss, and that is not the sort of protections the workers need.

Mr. GARCÍA OF ILLINOIS. Thank you, sir.

Councilmember Castex-Tatum, in your testimony you discuss how the Manual on Uniform Traffic Control Devices needs to be modernized. In the Infrastructure Investment and Jobs Act, Congress directed the U.S. Department of Transportation to revise MUTCD, including by making sure vulnerable users like pedestrians and cyclists are protected, and by incorporating AVs into the MUTCD for the first time. From the National League of Cities perspective, what reforms need to be made to the MUTCD to modernize it?

Ms. CASTEX-TATUM. The National League of Cities definitely supports the modernization of the manual. We think that better protection for road users equally is extremely important.

The main thing we want to point out is we want to make sure that this does not become an unfunded mandate on cities. Local governments own many of the roads in our cities, and they maintain those roads. So, concerning the manual, we just want to make sure that it does not become an unfunded mandate with those changes.

Mr. GARCÍA OF ILLINOIS. Thank you.

And thank you for your indulgence, Madam Chair. I yield back.

Ms. NORTON. The gentleman yields back, and I recognize Mr. Nehls now for 5 minutes.

Mr. NEHLS. Thank you, Chairwoman Holmes Norton and Ranking Member Davis, for having this hearing. I do have some concerns about how we integrate AVs safely onto roads and into the economy.

Trucking is a critical industry, and disruptive technology like AVs promises great increases in efficiency and safety, but it threatens jobs in our already strained truck-driving market. While I appreciate talking about how technology could disrupt the trucking market in 20 to 30 years, I want to talk about what is forcing truckers out of the profession today, now, and that is the vaccine mandate.

While the Supreme Court, thankfully, struck down the unconstitutional vaccine mandate imposed by President Biden, both the Canadian and U.S. Governments are imposing vaccine mandates on truckers just to be able to cross the border. We are releasing potentially COVID-infected aliens from Federal custody into our country on the southern border. But on the northern border we are not allowing truckers to cross, simply because they don't have the vaccine. Interesting. For the first 2 years of the pandemic it was considered safe. But now that the main variant causes less serious infections, the truckers must be vaccinated. It doesn't make a whole lot of sense.

This also threatens to disrupt trade with one of our most important partners, Canada, in the midst of an artificially created supply chain crisis. In Canada, we have seen a massive protest against these senseless mandates: a convoy of trucks 45 miles long [indicating photo] made it all the way to Ottawa to protest, and a similar protest is being planned in the U.S.

So, I have a question for Mr. Bloch. It is one question.

In your written testimony, you talk about the difficulties truckers face in the occupation, including supply chain inefficiencies that caused drivers to wait in line for hours. The freight division and the car-haul division of the Teamsters represents thousands of hard-working drivers across the U.S. and Canada. Do you know how many of your members either resigned or lost their jobs due to earlier vaccine mandates?

And is the union concerned about the new cross-border mandate's impact on your members' livelihood?

Mr. BLOCH. Well, thank you for the question, sir.

On the Federal policy and the cross-border, I will have to ask our Federal policy experts to respond to your question, which I am happy to do.

The California experience on the inefficiencies, I think everybody on this panel today who has worked for somebody or supervised

anybody during your career can appreciate the efficiencies you have with an employee, where you can direct that person to go somewhere and do something, versus this model that Mr. Lowenthal talked about of hiring truckdrivers as independent contractors.

Mr. NEHLS. OK, so, you represent—OK, got it. So, you represent 100,000 truckdrivers from California and Nevada, and you are telling me you can't answer the question of how many of those truckdrivers have been affected, how many have lost their jobs as a result of the vaccine mandate? You can't answer that?

Mr. BLOCH. I can tell you that we have heard complaints, but we have not seen resignations because of vaccine mandates here in California.

Mr. NEHLS. Very well, not surprising.

Mr. BLOCH. And sir, we did not take a position on the mandatory vaccinations, as well.

Mr. NEHLS. I am just saying, with all the issues we were facing across this country, and right now what you are seeing in Canada and now coming to the U.S. with vaccine mandates on our truckers, I am surprised that you, who represent the Teamsters, you couldn't have an answer to my question. But again, it doesn't surprise me.

Ms. NORTON. The gentleman yields back. Since a vote has been called on the House floor, the subcommittee will stand in recess, subject to the call of the chair. We will restart the hearing as soon as the last vote is over. That is approximately 30 minutes. It could be longer, and we do have a number of Members who haven't had the opportunity to ask their questions. We will reconvene after a recess for votes that are now being taken.

[Recess.]

Ms. NORTON. I want to call the subcommittee to order and resume the hearing while Members are returning, and we certainly have one Member here already.

Mr. Auchincloss, you are recognized for 5 minutes.

Mr. AUCHINCLOSS. Thank you, Madam Chair, and I appreciate the patience of our witnesses as we take a break to vote.

I want to start by emphasizing points that have been made in different threads by both my colleagues and by some of our witnesses, which is who needs to be at the table as we roll out autonomous vehicle technology.

With long-haul trucking in particular, as Mr. Bloch, I think you emphasize really quite articulately, the Teamsters need to be at the table, whether it is the hub model, whether it is a different model that ends up being the organizing architecture for an AV long-haul trucking system, unions and, in particular, the Teamsters, need to be at the table to make sure that we are sustaining, reinforcing, and cultivating good union jobs as we roll out this technology.

And then, insofar as AVs have a place in our cities—and maybe they do, maybe they don't, I think we are going to explore that over the next decade, and cities, mayors, and Governors really need to be the ones driving that ship, because they know what is best for their constituents. But insofar as we are rolling out AV technology in our cities, I would encourage us all to organize them around the premise of walkability.

What makes cities thriving places, what promotes public health, good environmental quality would help small businesses. What makes cities more livable for citizens of all abilities and ages is walkability, is the infrastructure and the ambiance that promotes walking and cycling. And we do not want an autonomous vehicle future to in any way undermine that. And it may not. It actually may promote it. And I think one way it could do that, as has been pointed out by one of our witnesses, is by reducing the need for parking, which has really been a plague of American urban land use for the last 70 years.

If we can drastically reduce the amount of parking that is required because of an autonomous vehicle fleet, a ride share fleet, that would be a good thing. And that would—that should be used as an opportunity for cities to promote walkability, and how they spend their infrastructure dollars, and how they repurpose public land.

One institution that really has not been brought up to date in this hearing as being an important stakeholder is the property and casualty insurance industry. And I would encourage my colleagues and I, as well as our witnesses from their varied perspectives, to bring in the P&C industry in these conversations.

The property and casualty insurance industry has a huge stake in making sure that we do this well. They are on the hook for a lot of the safety considerations, financially. They have got tremendous data, sometimes over the course of 100 years and at population scale, about what kind of behaviors make for safe driving, what kinds of infrastructure and semiotics make for safe driving. And they really need to be part of this conversation.

So, I would open it up to any of the witnesses to weigh in here about how they have worked with the P&C industry, or how they propose that we should work with the P&C industry to ensure a safe rollout of AV technology.

Ms. CHASE. Congressman, if I could respond to your question.

Mr. AUCHINCLOSS. Sure.

Ms. CHASE. By no stretch of the imagination do I speak for the P&C industry, but I wanted to share that our board of directors is comprised half of members of the P&C industry and half of other leading public health, law enforcement, consumer and safety advocates, and individuals. So, there are some wonderful companies that belong to Advocates for Highway and Auto Safety who are deeply devoted to making sure that autonomous vehicles, both cars and trucks, are developed and deployed in as safe a way as possible.

I also just wanted to comment on your remark about making sure that cities are walkable and bikeable. We share that as well. And one of the positions that we have been advocating for is to make vehicles more absorbing if there is a conflict or a crash with a car or a truck, especially delivery trucks, which are more ubiquitous in some of our neighborhoods, and bicyclists.

And my last point on that is, again, the urge for automatic emergency braking, to require that as standard equipment in cars, and not as an add-on in a luxury package, or only in a high-end vehicle, which not everyone can afford, because then it is an equity issue. Every family should be afforded the safest braking systems, and

that will be to tremendous value of all road users, especially vulnerable road users. Thank you.

Mr. AUCHINCLOSS. Thank you, Ms. Chase.

Mr. BEUSE. Congressman, I can add on from an industry perspective, if that would be helpful.

Mr. AUCHINCLOSS. Yes, very briefly, please. I am over time.

Mr. BEUSE. Sure. So, one of the things we have done is [inaudible] very, very important. And here in Pennsylvania we are on a committee, along with several other local firms that are working on self-driving, along with insurance companies. So, absolutely, they need to be at the table.

Mr. AUCHINCLOSS. Madam Chair, I yield back my time.

Ms. NORTON. The gentleman yields back.

Mr. [sic] Van Duyne?

Ms. VAN DUYNE. I have been called worse. Ms. Van Duyne. I identify as—

Ms. NORTON. I am sorry, Ms. Van Duyne. Please forgive me.

Ms. VAN DUYNE. No, you are fine. You are fine. Thank you very much, Madam Chairwoman.

Only a slim framework currently exists when it comes to automated vehicles across this country. Many States, such as Texas, have been leading the charge to provide safe testing, while also giving companies the flexibility to run productive tests.

As we continue to recover from the pandemic, employers struggle to find enough workers, experience slowed economic recovery, and are faced with national supply chain disruptions. A regulatory framework favoring AV deployment in the U.S. is critical for workforce opportunity and domestic growth.

The U.S. is home to a dynamic AV industry that provides job opportunities for Americans across the country. A regulatory framework favorable to deployment in the U.S. will ensure continued growth of this industry by having increased career opportunities and more seamless supply chains.

A 2021 U.S. Department of Transportation study found that Level 4 and Level 5 automation in the long-haul trucking industry would raise annual earnings for all U.S. workers by between \$203 and \$267 per worker per year. The study additionally found that trucking automation would increase total U.S. employment by 26,000 to 35,000 per year, on average, over 30 years.

So, Mr. Bloch and Mr. Samuelsen, the trucking industry currently needs approximately 80,000 drivers. I have heard this from businesses across the country, specifically within Texas. This need is expected to double by 2030. And yet, in your testimony you stoke fear of massive job loss and a layoff. And I have got to be honest with you, you are literally the only folks that I have heard that from in the country.

And I would be curious. What solutions do you propose to close these gaps, and if you do look toward the future and innovate through advancements in new technology?

Mr. BLOCH. Well, thank you for the question, and actually, we are not out running around, screaming about a robot apocalypse coming to take jobs in the trucking industry. I don't see it. I actually agree with—

Ms. VAN DUYNE. [Inaudible.]

Mr. BLOCH. OK, well, thank you. I don't go for hyperbole. And quite honestly, we do believe that, in some segments of the supply chain, we may see a net job increase.

I think that our concerns are more around the quality of jobs. We are doing a big push around our apprenticeship program here in California to train workers to take these jobs. The big concern is how long people stay in those jobs after we train them, and we don't want to invest a lot in California or anywhere in the country, including Texas, in training workers if it is just going to be a revolving door. And so, that is why I tried to tailor our comments to the quality of jobs that we are creating.

And I appreciate you raising those issues in your question, as well.

Ms. VAN DUYNE. Thank you.

Does anyone else have a comment on how to bridge the gap with the need in the current glut that we have got, if not through technology?

[Pause.]

OK, I will go on to my next question. North Texas is home to a growing AV industry, and has more aviation jobs than anywhere in the country. Autopilot requires extensive programming, and this creates new jobs to develop, maintain, and update the system, while increasing the efficacy and resulting wages for pilots in the aviation industry. So, why would autonomous motor vehicle technology not do the same thing for road transportation?

And would your members not benefit from safety and productivity and wage improvements?

Would your organization welcome the opportunity to represent the new folks who program and maintain these systems?

Mr. SAMUELSEN. Hi. If I may, and thank you for the question, I had no comment because we are simply not in the trucking industry. We are in the airlines and public transit and railroads. No trucking.

So, the question was posed as if somehow that we are opposed to the implementation of technology, or the development of technology, and the way that that can create jobs. It is simply not the case.

So, we are in favor of technology. We have embraced now waves of new technology and the jobs that that brings into public transit. We just want that technology harnessed in a way that creates and sustains jobs, doesn't have an unnecessary impact on workers, and doesn't jeopardize worker safety or rider safety. So, the comments that I have made all day, I think, sort of connect with the question you are asking, which is that type of innovation is good, and we embrace it.

We just want good jobs. We don't want workers inadvertently displaced where, if another route was taken in implementing all of this, they would be fine. So, we are good with innovation. We just want good union jobs across America, and we want safe jobs.

So, we do have a disagreement with the use of AV in public transit to replace bus operators. We believe it is dangerous. We believe automation should be under the control of a human operator at all times. And so, thank you.

Ms. VAN DUYNE. All right, thank you.

Mr. Bloch, did you have anything to add?

Mr. BLOCH. I would say very quickly, because you are out of time, yes. And if there are employers who are tuning into this hearing who think there are jobs out there, please call us. Please, please contact. Yes.

Ms. NORTON. OK.

Ms. VAN DUYNE. Awesome.

Ms. NORTON. The gentlelady's time has expired.

Ms. VAN DUYNE. Thank you very much.

Ms. NORTON. Ms. Bourdeaux, you are recognized for 5 minutes.

Ms. BOURDEAUX. Thank you, Chairwoman Norton, and thank you for holding today's hearing.

It is clear from the testimony that we are going to see automated vehicle technology increasingly woven into our transportation systems, and it is now our job to ensure that we, at all levels of Government, create safe, equitable, and well-researched AV policies that really maximize the benefits of this technology, while also protecting against the risks.

My district is home to Curiosity Lab at Peachtree Corners, which is a one-of-a-kind living lab, and it is designed to provide a real-world test environment to advanced next generation intelligent mobility and smart city technology. During a conversation with the head of Curiosity Lab in November, he mentioned that vehicles are taking over smartphones as the most connected devices in the world.

A key element of safety, of course, is ensuring that these highly connected, technologically reliant vehicles will not be hacked or remotely controlled, and one of the things that they are testing there is cybersecurity. So, I just wanted to talk about that a little bit.

And starting with Ms. Chase, in your testimony you list cybersecurity standards as one of the tenets of autonomous vehicle legislation. Could you fill us in, and talk a little bit about the current cybersecurity requirements for autonomous vehicles?

And are there additional standards or things we need to be thinking about to ensure their safety?

Ms. CHASE. Thank you, Congresswoman. I greatly appreciate the question, and you are completely correct that addressing cybersecurity and having a minimum standard is in our AV tenets.

I am not going to claim to be a cyber expert by any stretch of the imagination, so, I can't get granular into the details of that, other than to say we have deep concerns because we have already seen hacking and weaponizing some vehicles that have advanced technologies in them to the detriment of pedestrians and road users. So, it is a concern of ours.

And the AV tenets was really a collaborative process, as I mentioned earlier, with approximately 60 stakeholders representing a myriad of organizations. And we listened to everyone, and we created this living document, if you will, that we hope that the committee and the subcommittee will use as a foundation for future legislation.

Ms. BOURDEAUX. Thank you.

Mr. Wolf, do you have any thoughts on this? I know you talked about a similar issue earlier.

Mr. WOLF. Absolutely, Congresswoman, thank you so much for the question.

Cybersecurity is a challenge, which is one that is not limited to the AV industry, of course, but for the automotive sector and, of course, the economy writ large in all sectors. And so, the AV developers and manufacturers, they build in cybersecurity by design upfront, and it is something of paramount importance at the outset.

As we look ahead to ways in which the AV industry and the auto sector writ large can address cybersecurity vulnerabilities, we look at a robust, risk-based approach as the best way to address that, and I am happy to work with stakeholders on that process, going forward.

Ms. BOURDEAUX. Thank you very much. So, building on that—and back to you, Mr. Wolf—are there things that we should be doing in Congress to talk more about cybersecurity protections or build out standards? Should we be focused on software requirements, the workforce, physical infrastructure? What are the kinds of things we should be thinking about as we move forward with trying to find ways to support the deployment of these technologies?

Mr. WOLF. I appreciate the question. I think, ultimately, I would be happy to respond to you in writing with some of the more specifics here. A risk-based approach is intended on looking for what are those risks and vulnerabilities, and how can there be a framework that is able to adapt over time, rather than enact specific provisions and have a static, kind of, check-the-box exercise. So, that is the exercise that is important for this kind of policy.

And I know that, again, across different sectors—I believe it was the National Institute of Standards and Technology has a framework for cybersecurity, and a number of other measures can be adapted and applied in this context. And again, I am very happy to follow up in writing on that.

Ms. BOURDEAUX. OK, thank you very much.

I yield back.

Ms. NORTON. The gentlelady yields back. Representative Gimenez.

[No response.]

Ms. NORTON. Mr. Gimenez?

Well, Mr. LaMalfa.

[No response.]

Ms. NORTON. Representative LaMalfa?

Mr. LAMALFA. Thank you, Madam Chair. Yes, I am here, mostly. Thank you for convening today's hearing, and I had a few thoughts on what is going on here in rural California, and the effects of legislation on people that were providing Lyft and Uber services, and then tying that back in to what AV vehicles might be able to provide in our rural area.

Excuse my illness here today, I am at home and taking it easy here.

So, in my rural district in northern California, Lyft was performing about 2,500 rides late at night, which might entail people that have had too much to drink or other purposes, but certainly drunk driving and drowsy driving is something they want to avoid.

In the State of California, of course, a bill passed called AB5, and the PRO Act in DC is being modeled after that. So, the result was that they were trying to classify Lyft and Uber drivers as employees of companies there, when actually they really do have, in their own way, autonomy as to set their own hours and their own workplace, et cetera. So, the voters of California overturned that portion of AB5 via an initiative process to a referendum to say that had gone even too far over the line.

And so, what we are looking at is that rural areas are especially affected by less choices with these types of Uber and Lyft operators. As you can surmise, there is just going to be less people operating at those hours versus when you are in Washington, DC, et cetera. So, it is harder to compete for rural folks like that.

And so, if we find that they still can't compete because of the effects of AB5 or PRO Act coming through, then, Mr. Beuse and Mr. Wolf, what can autonomous vehicles provide, do you think, in rural settings like we are talking about here, very rural, many miles between towns, et cetera?

Mr. BEUSE. Yes, Congressman, thank you for the question. I think you point out at the macro level sort of an issue with regulations that sometimes kind of go the wrong way.

Specific to AVs, for example, when you look at the use case of where I live, for example, I wouldn't consider myself necessarily rural, but it can take, let's say, a half hour to get an Uber or Lyft out there. And you can think one of the use cases for AVs is to kind of load balance that, where that part of the population that doesn't get the magic of the service, as Dara would say, are better served by something like an autonomous vehicle operating on the network.

I think the issue is larger, though, right? The issue right now we have is that, in some States, it is particularly just not clear. So, for example, in California, there currently is just a flat-out prohibition on the testing and deployment of autonomous trucks. And so, until that gets fixed, we can't even start to address some of the issues that you are talking about with respect to trucking.

But one of the things we have to do is work closely with not just other industry partners, but also the Government partners to kind of really encourage a more future-looking view, and not trying to lock down things for what we know today.

I mean, having regulated at the Federal level for a while, rulemakings are challenging, and this is exactly, I think, the point I was raising earlier around we really need a more flexible approach here, and for DOT to continue the rulemakings that they are working—

Mr. LAMALFA. Well, let's bear down a little more on the rural aspect. I mean, we are talking long, long stretches of two-lane road, highway, and even turning down a dirt road, perhaps, for certain—whether you are talking deliveries or an Uber or Lyft situation via an autonomous vehicle.

How do you see it applying that well to areas that just have less infrastructure of markers or signs, or whatever you would use as an autonomous vehicle to tie into that?

Mr. BEUSE. Yes, exactly. Those are challenges that we have to solve within the operational design domain, or the area that we are going to go into.

I would point out, part of our mission at Aurora is to deliver this technology not just safely and not just quickly, but broadly. We believe there is a huge, huge impact far beyond our imaginations on what this technology could deliver. And certainly, I think rural America is part of that.

I mean, I grew up in a very rural part of town. We had one stoplight, so, I can relate.

Mr. LAMALFA. Yes, OK. Well, the time has flown by. I thank you. And I yield back, Madam Chairman.

Ms. NORTON. The gentleman yields back.

Ms. Strickland, you are recognized for 5 minutes.

Ms. STRICKLAND. Thank you, Chairwoman Norton and Ranking Member Davis.

As we consider the direction of this emerging technology, I know my constituents back home in the Washington 10th Congressional District want to see transportation developments that can improve their daily lives and also have a focus on equity. But they also want to know that they will be safe and secure on our Nation's roadways.

As we have heard today, there is evidence that AVs have the potential to reduce roadway deaths and injuries. And with 2021 being the deadliest year for motorists in Washington State in 15 years, I am glad that the subcommittee is exploring these possibilities. So, I have two questions, one for Mr. Wolf and the industry, and this is more of a conversation about messaging.

Could you very briefly talk to our constituents and people who may be hesitant, or not quite certain, or nervous about AV deployments happening across the country?

And what would you tell them after this discussion today? What should be the big takeaway for people outside of our bubble?

Mr. WOLF. Thank you so much, Congresswoman, for that question. The simple and straightforward answer is that the data is clear: autonomous vehicles are not only safe, but they are making our roads safer.

There is a crisis on our roadways, as has been discussed a number of times in this hearing, and it cannot be stated enough. And the number of crashes and fatalities and severe injuries continues to go up at an alarming rate, and in the overwhelming majority of those, there is a contribution of a human behavioral issue, whether it is distracted driving, drunk driving. Those are the numbers, and it is a big problem.

So, autonomous vehicles, the industry that we represent and the members of our association, are designing technology that will address that specific issue, and it will have a dramatic impact on safety, in conjunction with many other solutions that were put forward by Secretary Buttigieg and the National Roadway Safety Strategy.

So, first and foremost, this is about improving safety, not just of other drivers on the road, but vulnerable road users, as well: bicyclists, pedestrians, across the whole gamut. So, that is the key thing.

And I would just very quickly enumerate the other benefits: with respect to equity, the ability to enhance and expand mobility for individuals with disabilities; and with respect to economic growth,

there are tremendous benefits that accrue to society as a result of the deployment of AVs, and what we are looking to do is build out a national framework to scale that deployment in a way that brings those benefits to the greatest number of people as possible.

Ms. STRICKLAND. Great. Well, thank you very much. Now I would like to turn to Vice Mayor Pro Tem Castex-Tatum.

And welcome, ma'am, it is nice to see you here. And I am a former mayor myself, so, I really appreciate that you are here today. And I would like to ask you, on a local level, what specific infrastructure investments have been needed in your city, in Houston, or any dedicated lanes as you tried to prepare for this deployment? That is the first part.

And then the second part, tell me how you have done this through the lens of equity, as a leader.

Ms. CASTEX-TATUM. Thank you for that question. I can speak from the pilots that we have had, here in Houston. With the pilot that we had at Texas Southern University, in conjunction with METRO, we had a shuttle that was riding on the campus of Texas Southern University, and that was phase 1. We are working in phases. Phase 2, we are looking at going off-road between two universities. So, as we work through each of the phases, we are hoping to gather more data so that we can make sure the infrastructure works alongside of the autonomous vehicles.

With our work with Nuro, which is delivering for businesses, we have seen transportation become less of a barrier for some of our lower economic communities. Specifically, during our time with COVID, Nuro was able to deliver senior boxes to apartment complexes in one of our poorer areas in the city of Houston, one of our complete community areas, one of the areas where residents need assistance with getting groceries.

So, we see the opportunity for these autonomous vehicles to really help the quality of life for some of our residents who can't drive to the store because they don't have a car, or some of our differently abled constituents to get their prescriptions delivered. So, we see this as a new and innovative way for us to meet the needs of our residents, and really improve their quality of life in cities.

Ms. STRICKLAND. Great. Thank you, Madam Vice Mayor.

Madam Chair, I yield back.

Ms. NORTON. The gentlelady yields back.

Mrs. NAPOLITANO, you are recognized for 5 minutes.

Mrs. NAPOLITANO. Thank you, Chairman Norton. My statement would be that it is going to create quite a bit of confusion, people seeing driverless cars and trucks. So, we have got to be sure that we—because that is going to be a tremendous traffic safety hazard. But I have a question for Mr. Bloch.

I agree with your testimony regarding the concerns over the misclassification of truckdrivers. And I have met with some of the drivers in southern California that work 14-plus-hour days, make below minimum wage with no benefits because of forced independent contractor status. The State of California has been trying to crack down on these companies, but the Government needs to step in and do more. I authored a provision in the bipartisan infrastructure bill that creates a Federal task force to study the problem and create policy to address this problem.

Secretary Buttigieg recently announced a plan to formulate the task force. What are your thoughts on what the Federal Government can do to address this problem?

Mr. BLOCH. Thank you very much, and this has been a problem the Teamsters Union has been combating for the last 40-plus years, since deregulation of trucking. And prior to that, 90 percent of the truckdrivers in the United States made good wages working under a Teamster contract, and I wish that was still true today.

I can speak to the California experience that Mr. LaMalfa mentioned, which came out of a court ruling against a package delivery company using independent contractors that competes with UPS, one of the largest private-sector employers in his district. A UPS driver makes \$100,000 a year in California, on average, has fully paid family health insurance and a pension. And it doesn't matter if you have a criminal background or just a high school education, you can get that job.

The California law that passed, and the portions of the PRO Act that deal with misclassification, came out of a court case involving a company that was competing with UPS and undercutting those good wages. And that is the issue that is happening within the trucking and transportation industry in the United States. And so—

Mrs. NAPOLITANO. What can the Federal Government do to make it better, to address it?

Mr. BLOCH. So, having a task force to look at misclassification is very important. The new ABC test, the provisions in the PRO Act that Mr. LaMalfa mentioned, is a test in many States in the United States, and it is the most stringent test to address the classification of workers.

Mrs. NAPOLITANO. Thank you very much.

Mr. Samuelson, I want to thank the Transport Workers Union for working with me on a provision in the bipartisan infrastructure bill that improves transit safety program with busdriver protection and blind spot removal requirements. How can technology help drivers with blind spot issues and general safety issues?

Mr. SAMUELSEN. Well, thank you for the question. In terms of blind spots on buses, it is a fact that buses in the United States, across every transportation district, every transit provider, bus operators are ordered to go through pedestrian right-of-way areas to maintain schedule on buses with blind spots. And that is a bit of a disaster waiting to happen, and it is an example of where technology has such an extremely positive place, in terms of collision avoidance and that type of thing, in order to protect pedestrians, protect riders, and protect the operator. And so, technology does have its place.

And I am sorry, you asked a second question, and I forget what that one was.

Mrs. NAPOLITANO. Well, how the technology helps drivers with a blind spot. Because if they implement it in the AVs, then it solves a problem that might work. I don't know what technology can do to avoid having a blind spot, to help prevent accidents.

Mr. SAMUELSEN. Oh, absolutely. Our position, essentially, across the entire spectrum of this conversation, is that the technology should be utilized to increase safety, to increase service reliability,

increase state of good repair where that is applicable, and all synergistically working with a bus operator. We believe that that is the safest outcome, a bus operator being in control of the automation, a bus operator that can pull a switch and end the dangerous situation if one is arising. But yet utilizing the technology to improve safety and improve service delivery.

Mrs. NAPOLITANO. Thank you, sir.

Ms. NORTON. Thank you very—

Mrs. NAPOLITANO. The AV issues are enormous, so, we have to be very careful. Thank you, Madam Chair.

Ms. NORTON. I thank the gentlelady for her questions.

Mr. Carbajal, you are recognized for 5 minutes.

Mr. CARBAJAL. Thank you, Madam Chair, and thank you to all the witnesses that are here today. Thank you for your time and your testimonies.

From passenger to commercial vehicles, there is no doubt that autonomous vehicles will become integrated into our transportation system in the coming years. Congress must begin preparing now to legislate in a way that optimizes economic benefits, prioritizes safety, and avoids job displacement.

I am interested in learning how Congress can support the growth and deployment of AVs, but also what we should be considering when it comes to safety regulations and ensuring transportation workers have a place in this workforce.

Mr. Samuelsen, you note that the Department of Transportation, DOT, innovation principles will put job creation and workers at the center of the innovation development process. Elements of these principles include forging partnerships with the private sector while protecting interests of the public, workers, and communities. How can Congress promote partnerships with the private sector and local communities in ways that facilitate support for workers by expanding access to skills?

And how can these partnerships wrap around ongoing deployments and pilots to develop and build training models?

Mr. SAMUELSEN. Right, so, thank you for the question.

The Federal Government plays a vital role, from workforce development and across a whole wide array of other necessities, as we go into the future of public transit. Now, as the Federal Government doles out money to transit providers, the Federal Government needs to ensure that those transit providers are doing everything that you said, both in terms of investing in workforce development so that workers aren't left behind, and also involving communities that workers live in, and the decisions on what public transit will look like going forward.

And you have said—I believe you said a couple of times—about the deployment of automated vehicles in public transit. And again, we would be adamantly opposed to that. And it is not just about the degradation of jobs, which is bound to come, despite what some people might put forth about how this is going to be a job creator. When you talk about automated vehicles, automatically what that is going to lead to is the degradation or the diminishment of bus operator jobs.

And we are opposed to that on a whole bunch of levels, and the main one is that service delivery and public transit delivery is

about more than the amount of buses that you put out. It is about service quality and service reliability. And we believe that innovation technology is best utilized, as I said before, in conjunction with a human operator, technology used to augment the safe operation of buses, augment service reliability, augment scheduling in a positive way to ensure that service delivery is at the highest level it can be for our riders. Thank you.

Mr. CARBAJAL. Thank you.

Vice Mayor Castex-Tatum, it is exciting to hear about the successes of pilot programs in Houston. How did Houston work with the industry to implement these programs safely and equitably?

Ms. CASTEX-TATUM. Well, I will tell you that Nuro came to us with their pilot and their bots, and we met with them. We had an opportunity to also introduce their product to the community. We introduced them to the law enforcement officers in our community so that, once they started to see these bots on the roads, if there were any problems or concerns, they would know how to interact and who to contact.

So, I say it all the time, Government can't do this work alone. So, these public-private partnerships are extremely important for us to make sure we are meeting the needs of our constituents and really doing our best to try to make their quality of life better.

So, we are excited about the opportunity to bring services directly to people's homes, and also to provide shared services to help get one person out of one car. And we think that the autonomous buses will allow us to get some cars off the road and move more people at the same time so that we won't all be sitting in traffic all the time.

Mr. CARBAJAL. Should other cities wish to implement similar programs, what lessons can they learn from Houston?

Ms. CASTEX-TATUM. I think it is important that they start piloting with companies like Nuro and transit authorities like METRO. We learn as we pilot and gather data. That is why, as the National League of Cities, we are asking for Federal partnerships for more testing in more places, so that we can provide more data and get more AVs to have some regulated safety standards. So, my suggestion would be keep piloting.

Mr. CARBAJAL. Thank you. I am out of time, I yield back.

Ms. NORTON. Thank you very much. Next, we have Mr. Moulton for 5 minutes.

I recognize you, Mr. Moulton.

Mr. MOULTON. Thank you, Madam Chairman, and thank you to all the witnesses for sticking this out. I know this is a long time, but we are grateful for your wisdom on this incredibly important issue.

Professor Larco, if I may start with you, Motional, which is an AV company headquartered in Boston, has partnered with Hyundai to develop AV fleets. But without a Federal regulatory and legal framework for AVs, testing their technology looks different in Massachusetts than it does in Nevada, or at least that is how I understand it. So, States, essentially, are being burdened with the absence of clear Federal guidance.

Beyond the burden to individual States and communities like Nevada and Massachusetts, what does this cost with regard to our national priorities, to not have these Federal standards?

Mr. LARCO. Thank you very much for the question. I think you are absolutely right that a lot of the deployment of AVs are actually—it is a local issue, right?

And a lot of the things that I talked about before, some of these ramifications, cascading impacts, are really going to be affecting different communities differently, and there needs to be some control at the local level to be able to respond to these things.

The conversation that we have had so far, it is fantastic to hear, the issues around safety and labor. But I guess the—one of the main points is that that is not the only questions that are important for AV deployment, and we really need to be working at the local level to be able to answer some of these things.

To answer your question about the role of the Federal Government, I would say what is really important is that the Federal Government actually does many of the things that we have been talking about here: help support pilots, and help support research into these topics, and support cities, but making sure that it is not only about safety and about the technology itself, but really looking at these cascading impacts.

Mr. MOULTON. So, to follow on on that, Mr. Wolf, the U.S. can be first in marketwide AV deployment, or we could cede that leadership to countries like Germany, allies, or competitors like China. How will the U.S. market and efforts to create a Federal framework be impacted if we don't act first, if China sets the rules of the road for AVs?

Mr. WOLF. Well, thank you so much for the question, Congressman. I think it is a critical issue that I don't think we have discussed enough today, and that is American leadership in this technology.

America is the birthplace of autonomous vehicle technology and, in many respects, it has got the largest amount of investment, and we are the leader in that technology. Where we are slow, where our edge is eroding is in the regulatory framework component. The national framework piece is a critical aspect of being able to scale the technology. And in that respect, the countries that you mentioned and others are catching up in being able to allow technology to scale and deploy there.

So, the biggest thing that needs to happen, from the industry's perspective, and I think it sounds like from the perspective of a number of folks, is actually we need to proceed without delay to enact this national framework that has a couple of components. And the way we structure it is really two pieces.

It has to be able to enhance consumer and public trust in the technology. That is first and foremost, and that comes from completing a number of rulemakings that NHTSA has underway and the Federal Motor Carrier Safety Administration has underway, and a number of other initiatives that can help on that front.

But the second part—and they must go hand in hand—is to maximize deployment of the technology. The vice mayor is correct. One of the key things that comes from being able to scale the technology in the interim, while rulemakings are in process, is the in-

formation that regulators and policymakers can get from being able to deploy the technology. So, raising exemption caps, being able to put new and different kinds of vehicles on the road in the interim, that is critical. We have to maximize deployment to keep that position, that leadership position.

Mr. MOULTON. So, Mr. Wolf, just following on that, and specifically on your first point about consumer trust, I hear a lot of concerns from constituents, from technology experts, perhaps most concerningly from some artificial intelligence experts, about the degree of trust that drivers currently place in their Teslas. So, a rather technical question, but why is Level 3 and above automation different than what Teslas are using on the road with us today, and do you think these technologies are safe?

Mr. WOLF. Well, I appreciate the question, Congressman.

I think the key thing there is that the AV Industry Association, we represent Level 4 and above, and the distinction is critical because Level 4 and Level 5 autonomous vehicles are not designed to have nor do they have any expectation of a human involvement in the performance of the driving task.

Mr. MOULTON. Right, but a lot of humans today read the newspaper behind their Tesla, so, there seems to be an expectation that they don't need to do anything.

Mr. WOLF. Well—

Mr. MOULTON. That is a problem, right?

Mr. WOLF. To that exact point, Congressman, Tesla is not a Level 4 or Level 5 technology. It is a driver assistance technology. And as we were discussing a little bit earlier, it is very important to your point, sir, that we are very clear what the difference between those technologies are, so that consumers are not confused and engaged in dangerous activity with driver assist technology that they assume is autonomous vehicle technology. Those things have to—they are different industries, different business models, different technologies. All of it needs to be separated very clearly, and we welcome the dialogue and working with other stakeholders to do that.

Mr. MOULTON. Well, thank you.

And thank you, Madam Chair, for giving me a little bit more time, because I do think this is a critical issue, and clearly, there is work that the Federal Government needs to do in this regard. So, thank you, I yield back.

Ms. NORTON. Of course, Mr. Moulton.

Ms. Williams, you are recognized for 5 minutes.

Ms. WILLIAMS OF GEORGIA. Thank you, Madam Chair, and I want to thank all of the witnesses here today that are testifying for sticking it out with us, for waiting through the votes. When you get to a freshman Member whose last name starts with a "W," you know you are in the home stretch, and it is almost time to go home. So, thank you, thank you.

When people say that Congress writes the rules of the road, that is usually just an expression, except here on the Highways and Transit Subcommittee, because, y'all, we really do write the rules of the road. And our job is to be sure that we are writing the rules as quickly as the roads are changing, while centering safety, workers, and innovation, simultaneously. When it comes to writing the

rules of the road for automated vehicle technology, this is no different, and we must center transportation workers and the people who rely on transportation systems every day.

Vice Mayor Castex-Tatum, in your testimony you highlighted the importance of achieving zero fatalities on our roads. What role do you see automated vehicle technology playing in achieving that goal?

And how can Congress start writing policy in preparation for automated vehicle technology that prioritizes safety for both motorists and pedestrians?

Ms. CASTEX-TATUM. Thank you for that question, Representative Williams. Zero is the only number that makes sense for us with fatalities on the road.

NLC's position is we are recommending more pilot partnerships with our cities. That way, we can have more testing in more places, more climates, more areas, our rural areas, the areas that are urban. We need more data so that autonomous vehicles can get their own safety standards. Until we have more information, I think that we will need to do more testing, more piloting so that you can write the rules that would be equitable across the country.

Ms. WILLIAMS OF GEORGIA. Thank you. And last week I took the time to speak with State and local elected officials in my district about many of the programs and opportunities that exist in the Bipartisan Infrastructure Law. One of the programs that garnered interest was the Safe Streets and Roads for All program, which funds projects aimed at reducing traffic fatalities.

Vice Mayor Castex-Tatum, how could a critical program like this support projects that both advance responsible technology and reduce traffic fatalities?

Ms. CASTEX-TATUM. We definitely want to take the human error out of the fatalities that are happening on our roads, and we feel like autonomous vehicles is that opportunity that can take that human error out of the numerous number of crashes that are happening on our roads. The sensors that are on these autonomous vehicles have shown that they are stronger than the human eye. The vehicles can react faster than a human.

This technology is very innovative. However, it is still very premature, and there still needs to be more piloting and more data collected so that we can do all of this innovation safely, and make sure we are protecting the public trust.

Ms. WILLIAMS OF GEORGIA. Thank you.

And Mr. Samuelsen, in your testimony you mentioned the importance of protecting collective bargaining principles at every stage of automated vehicle development, including during research, testing, and implementation. Can you elaborate on this, and tell me how these principles can be implemented at each state of technology development to ensure that workers have a seat at the table every step of the way?

Mr. SAMUELSEN. Yes, and thank you for the question.

So, as the technology comes in, and what needs to be done, definitely, which has been referenced here many times today, is that the Federal Government needs to set up a framework that protects workers, protects jobs, doesn't allow a situation where transit pro-

viders—and I am speaking strictly in transit—transit providers implement technology in a blindsided manner that eliminates workers.

So, the Federal Government has an ability to compel transit operators, transit employers to engage in workforce development investment, and also to engage with communities and workers in such a way where waves of technology that are going to impact working neighborhoods and impact workers themselves are discussed well ahead of time, well before the time of implementation.

And those things are happening now, where workers have power to compel that to happen; for instance, in New York City, where that is very common, it is a very common element of the TWU contracts that we have in New York. But the Federal Government needs to adopt this as a uniform standard, so that it happens city after city after city, transit provider, transit provider, and on.

Ms. WILLIAMS OF GEORGIA. Thank you, Mr. Samuelson. My policymaking always centers those most marginalized, and building a transportation system that is accessible for all is always a top priority for me on this committee.

I do have additional questions that I will submit for the record, and I hope that I can get further answers.

And Madam Chair, I yield back the balance of my time.

Ms. NORTON. Thank you, Ms. Williams. Your time has expired.

Ms. WILLIAMS OF GEORGIA. No time to yield.

Ms. NORTON. Mr. Stanton, you are recognized for 5 minutes.

Mr. STANTON. Thank you very much, Madam Chair, for holding this important hearing, and thank you to each of the witnesses for your important testimony today.

Arizona, and my district in particular, has been at the epicenter for the development and testing of autonomous vehicles. In Chandler, Waymo is operating a fully driverless vehicle as part of its ride hailing service, Waymo One. In Scottsdale, Nuro and Cruise have partnered with retailers for local deliveries. And in Tucson, Arizona, TuSimple recently completed its first fully autonomous semi-truck run on the open road between Phoenix and Tucson.

AVs have the potential to transform our transportation system by improving mobility for vulnerable populations or those who face barriers to transportation, enhancing vehicle safety, reducing vehicle crashes and deaths, and increasing productivity. At the same time, we also need to recognize that AVs have the potential to alter our workforce, and we want to keep as many people employed as possible.

As Congress continues to consider the Federal role in the testing and deployment of AVs, it will be important for this committee and all of the entities represented by the witnesses before this committee today to have a seat at the table. My first question is for the vice mayor, Vice Mayor Castex-Tatum.

I am a former mayor myself. I come from the city world, the former mayor of Phoenix. I know firsthand that leadership at the local level is key to fostering innovation. What are your thoughts about what the Federal Government can do to support and collaborate with cities in AV testing and development?

Ms. CASTEX-TATUM. Again, I will reiterate the importance of piloting with the cities. We want to see partnerships with cities that

create more testing in more places, providing more data, and really working to get autonomous vehicles their own safety standards.

Mr. STANTON. Thank you very much. My next question is for Mr. Marler.

Mr. Marler, there are many public places and public and private stakeholders involved in AV development. Your testimony calls for Federal leadership to help direct the conversation surrounding AVs. What role can the Federal Government play to help facilitate the safe deployment of AVs to meet community needs?

Mr. MARLER. Thank you for that question. In Iowa, we have convened a public-private multisector vision for AVs, and we created a space for this in our State via the Iowa Automated Transportation Council. We have done this regionally in the Midwest, among our 10 Midwestern States, and it is our view that we need to replicate these types of engagements at the national level, and establish a clear, consistent vision, strategy, and framework.

There is sufficient energy across the Nation, in terms of this conversation. It has been somewhat fragmented. In Iowa, we call them silos of excellence. Congress can foster this collaborative environment at all levels of Government. We believe that you can convene a new national dialogue and conversation. You can make sure that we are engaging a broad cross-section for input, including local communities, both public and private. And also, there are some great collaborative efforts already underway that support is critical for, like the Cooperative Automated Transportation Coalition.

So, those are some thoughts on how we might meet some community needs.

Mr. STANTON. I appreciate it. This is for yourself and any other witness that may want to answer.

A significant number of roadway fatalities occur on rural roads. One of the challenges on the use of connected and automated vehicles is the lack of required infrastructure features to accommodate them in rural parts of our country. What can and should be done to prepare rural America for the expanded use of AVs?

Mr. MARLER. I would be happy to start with an answer to that question, and thank you for that question. Really, two things that we are looking at.

First is, we do need to look at our physical infrastructure, and make sure that we have good condition pavements, our signs, our lane markings, that these things are in good condition in our rural areas, especially. But the investment can still be challenging. Our rural areas do struggle to have the available levels of funding to ensure that they are making those stewardship investments that they need.

The second thing we can do is really an emphasis on digital infrastructure, really looking at our broadband, particularly in rural areas, looking at our mapping, looking at our connectivity and spectrum. This is why the spectrum question is so critical. These things, these two components, both physical and digital for our rural areas, they really have the opportunity to lift our rural communities across our Nation.

Mr. STANTON. In my short time left, any other witness want to take a—

Mr. BEUSE. Yes, I will chime in here, just add something from an industry perspective.

Two points you raised. One, we find a lot of value in the convening power, both at the State level, like Congress is doing today, but also even at the USDOT level to really bring all stakeholders together. My personal opinion is I don't know that we have done enough of that lately on these particular issues.

On your point about rural, part of our mission is to deliver this technology broadly. In fact, when you look at even some of our locations right now, they are what are considered to be rural America. And I think we need to keep that in the conversation, as well. I mean, many of the paths that highways cut through are rural in nature, and there are a lot of needs that probably should be considered, again, to support the efficiency and effectiveness of the roll-out.

Mr. STANTON. All right, I have run out of time here, so, I am going have to yield back. But I would love to get, at a later time maybe, a separate conversation with our representatives of organized labor about some of the thoughts on that one, as well. I will yield back.

Ms. NORTON. Thank you very much. I would like to thank each of the witnesses for your testimony today.

You can see by how many Members came back after the votes to ask questions, that this was an important hearing in our committee today. Your comments, you who have testified today, have been very informative and very helpful.

I ask unanimous consent that the record of today's hearing remain open until such time as our witnesses have provided answers to any questions that may be submitted to them in writing.

I also ask unanimous consent that the record remain open for 15 days for any additional comments and information submitted by Members or witnesses to be included in the record of today's hearing.

Without objection, so ordered.

The subcommittee stands adjourned.

[Whereupon, at 3:22 p.m., the subcommittee was adjourned.]

SUBMISSIONS FOR THE RECORD

Prepared Statement of Hon. Sam Graves, a Representative in Congress from the State of Missouri, and Ranking Member, Committee on Transportation and Infrastructure

Thank you, Chair Norton, for holding this hearing, and thank you to our witnesses for participating today.

Throughout my time on the Transportation and Infrastructure Committee, one of my top priorities has been to support innovation, and make sure that advancements in technology are incorporated into our transportation system.

Automated Vehicles (AVs) may be one of the most transformational innovations in transportation since the automobile was invented.

Automated trucks and buses have the potential to increase mobility, and make our transportation system safer and more efficient, and the movement of goods less costly.

AVs will create new highly skilled jobs and strengthen our economy.

While many have called for a federal regulatory framework, such a framework should not be overly prescriptive but instead create guardrails for the industry to grow with safety at the forefront. We must avoid stifling innovation as it is just getting off the ground.

Striking this balance is vital for America to secure our global competitive edge in this industry.

I look forward to hearing about challenges and solutions to full deployment of automated trucks and buses.

Thank you again to our witnesses, and I yield back.

Post-Hearing Supplement From Witness John Samuelsen to His Remarks to Hon. Mike Bost, Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 4, 2022.

The Honorable MIKE BOST,
House of Representatives,
1211 Longworth House Office Building, Washington, DC 20515.

DEAR REPRESENTATIVE BOST:

I appreciated your question to me during the recent Highways and Transit subcommittee hearing “The Road Ahead for Automated Vehicles”. You noted a very important issue and I wanted to get you a more extensive, detailed answer.

During our exchange you asked:

What additional training needs are there for mechanics on automated systems? Are there additional safety concerns for workers around automated trains or buses? What can we do to make sure that maintenance workers are prepared for these kinds of vehicles once they enter deployment?

There are two groups of maintenance workers that will have to interact with this kind of technology very differently: mechanics fixing these vehicles—who will need to have equipment-specific training—and the workers maintaining tracks, roads, and the rest of the built environment around these vehicles—who will need clear safety protections and trust that an autonomous system would be able to recognize and follow safety procedures. In both cases, the federal government needs to be an active partner and regulator to ensure these vehicles meet existing standards.

Mechanics working on AV-equipment will need access to all of the vehicle’s systems along with the diagnostic tools necessary to troubleshoot and repair issues as they arise. This could mean more training on software or other advanced tools. Especially for commercial fleets, which may have many purpose-specific operational

rules or limitations, these workers will need significant job-training investments to make sure that they can continue to do their jobs on this new equipment.

For track workers, road workers, and others who are working on active roadways, it is essential that workers trust that any vehicle around them will stop, slow down, or divert to maintain a safe distance. If these workers don't believe that a train car is going to stop for them to clear a track, they cannot do their work. No AV should be allowed to operate in these kinds of situations if the safety of the workers around the vehicle cannot be guaranteed (as well as the safety of those inside the vehicle).

Thank you again for your thoughtful comments and questions. I look forward to working with you on these issues.

Sincerely,

JOHN SAMUELSEN,
International President, Transport Workers Union of America, AFL-CIO.

cc: Committee on Transportation and Infrastructure, Subcommittee on Highways and Transit staff

Post-Hearing Supplement From Witness John Samuelsen to His Remarks to Hon. Julia Brownley, Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 4, 2022.

The Honorable JULIA BROWNLEY,
House of Representatives,
2262 Rayburn House Office Building, Washington, DC 20515.

DEAR REPRESENTATIVE BROWNLEY:

I appreciated your question to me during the recent Highways and Transit subcommittee hearing "The Road Ahead for Automated Vehicles". You noted a very important issue and I wanted to get you a more extensive, detailed answer.

During our exchange you asked: "*Why do you think there is such a disconnect between the real statistics and the rhetoric [regarding the safety of autonomous vehicles]?"*

There is a significant gap between the promises being made about AVs and the reality of this technology today. While manufacturers and software developers have focused exclusively on the *potential* future benefits of these vehicles, the technology available today is not as safe as the average human operator even in personal vehicles.

AVs operate on public roads through a series of waivers and exemptions from safety rules. The expected result of these waivers is exactly what we're seeing: more accidents for the vehicles that have the most exemptions from safety requirements. Whatever the public perception may be, it is up to our elected leaders in Congress and the safety professionals in the administration to hold all technology accountable to our safety standards rather than bow to marketing campaigns.

Thank you again for your thoughtful comments and questions. I look forward to working with you on these issues.

Sincerely,

JOHN SAMUELSEN,
International President, Transport Workers Union of America, AFL-CIO.

cc: Committee on Transportation and Infrastructure, Subcommittee on Highways and Transit staff

Letter of February 1, 2022, from Garrick Francis, Vice President, Federal Affairs, Alliance for Automotive Innovation, Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 1, 2022.

The Honorable ELEANOR HOLMES NORTON,
Chair,
Subcommittee on Highways and Transit, House Committee on Transportation and Infrastructure, U.S. House of Representatives, Washington, DC 20515.

The Honorable RODNEY DAVIS,
Ranking Member,
Subcommittee on Highways and Transit, House Committee on Transportation and Infrastructure, U.S. House of Representatives, Washington, DC 20515.

DEAR CHAIR NORTON AND RANKING MEMBER DAVIS,

On behalf of the Alliance for Automotive Innovation (Auto Innovators), I appreciate your attention to the importance of developing a national strategy to support the incorporation of automated vehicles (“AVs”) and technologies into our nation’s transportation networks, services, and infrastructure. The U.S. has an opportunity to advance its leadership role in developing these revolutionary technologies and new mobility business models that have the potential to contribute to a safer, cleaner, more accessible, and equitable transportation future.

Auto Innovators was formed in 2020 to serve as the singular, authoritative, and respected voice of the automotive industry in the United States. Our members include auto manufacturers producing nearly 99 percent of the cars and light trucks sold in the U.S., along with original equipment suppliers, technology companies, and other automotive-related value chain partners. In total, our industry supports roughly 10 million jobs in America, accounts for approximately 5.5 percent of our country’s gross domestic product and represents our country’s largest manufacturing sector.

As a global leader in the development of AV technologies, the U.S. is at the forefront of innovations that will transform transportation in a number of ways. Safety, of course, is a critical component in the development of AVs. Another benefit of these vehicles is the promise to provide life-changing opportunities for those who are not adequately served by existing mobility options, such as seniors, persons with disabilities, and those who require more affordable transportation. Further, the benefits of these vehicles extend to other roadway users, not to mention the benefits that AV’s have shown various communities and individuals in need during the COVID–19 pandemic.¹

The U.S. has the opportunity to drive AV innovation. According to KPMG, the U.S. is home to the headquarters and testing locations of more than 425 AV companies, nearly half of all companies tracked for their annual Autonomous Vehicles Readiness Index.² In fact, AV companies continue to safely test vehicles in California, Arizona, Nevada, Texas, Florida, Michigan, Pennsylvania and other states to further research and validation of key technologies, bringing with it not only technological leadership, but jobs, investment, tax revenue and local economic growth.

As these technologies mature, including companies today on the cusp of initial commercialization in the U.S., the nation needs updated federal regulations and a pathway to scale their development with appropriate oversight in order to realize many of the promises of this technology. That is why a responsible federal framework for the safe development, testing and deployment of AVs in the United States is so important. Consistent with the Department of Transportation’s newly released principles for innovation, this will help to preserve U.S. leadership in these potentially life-saving and life-changing technologies and ensure U.S. innovations benefit the traveling public and our economy for decades to come.

As we have witnessed in other technologies and sectors, the nations that lead the development of AVs will have the potential to guide the development of international standards, control supply chains, and define international markets. With a technology like AVs, this could have implications far beyond transportation. This is not simply a question, therefore, of global or economic competitiveness. It is about defining the future of this technology—and associated infrastructure—in a manner

¹ See e.g., Jane Lanhee Lee, Nathan Frandino, *Reuters*, “Self-driving vehicles get in on the delivery scene amid COVID–19,” (April 29, 2020) available at <https://www.reuters.com/article/us-health-coronavirus-self-driving-deliv/self-driving-vehicles-get-in-on-the-delivery-scene-amid-covid-19-idUSKBN22B2LZ>.

² <https://assets.kpmg/content/dam/kpmg/xx/pdf/2020/07/2020-autonomous-vehicles-readiness-index.pdf>

that emphasizes safety, responsibility, and opportunity for more citizens to benefit from this transformative shift in mobility.

While the U.S. is well positioned to continue its long-standing leadership in automotive innovation, we cannot be complacent. Across the globe, nations are backing bold commitments with government investments and supporting policies. That is why in December 2020 Auto Innovators released the AV Policy Roadmap. The Roadmap outlines the auto industry's AV policy priorities and includes fourteen specific recommendations that can be implemented by federal policymakers over the coming years to facilitate the testing and deployment of AVs at scale. These recommendations are focused on reforming regulations, harmonizing policies, and laying the foundation to achieve longer-term objectives—including expanding the number of exemptions that U.S. DOT can provide on a case-by-case basis—with safety oversight and full enforcement powers—which can then provide the data necessary to support future Federal Motor Vehicle Safety Standards for AVs.

We are approaching a pivotal moment in the evolution of this technology and have an opportunity to work collaboratively to chart a course that sustains U.S. leadership and innovation in these critical safety and mobility solutions for decades to come. We look forward to continuing to work with you and your colleagues in Congress, as well as the Administration and other stakeholders, to realize the benefits of a safer, more environmentally friendly, accessible, and equitable U.S. transportation future.

Sincerely,

GARRICK FRANCIS,

Vice President, Federal Affairs, Alliance for Automotive Innovation.

cc: The Honorable Peter DeFazio, Chairman
 The Honorable Sam Graves, Ranking Member
 The Honorable Frank Pallone, Chairman, House Committee on Energy and Commerce
 The Honorable Cathy McMorris Rodgers, Ranking Member, House Committee on Energy and Commerce

**Statement of the American Association of Motor Vehicle Administrators,
 Submitted for the Record by Hon. Eleanor Holmes Norton**

Dear Chairman DeFazio, Ranking Member Graves and Members of the Committee:

The American Association of Motor Vehicle Administrators (AAMVA) thanks the Committee for holding its February 2nd hearing entitled, “The Road Ahead for Automated Vehicles.” From the start, AAMVA and its state-based membership have been leaders in describing how automated vehicle technologies can make the transition from concept to deployment. AAMVA has contributed our expertise for more than a decade to finding the safest path forward for these life-saving technologies. As Congress continues to contemplate the federal policy platform for Automated Driving Systems (ADS) and Advanced Driving Assistance Systems (ADAS) AAMVA offers the following in support of the hearing.

AAMVA's state-based transportation experts have developed a resource guide documenting their contributions in moving these technologies to our roadways. AAMVA's “Safe Testing and Deployment of Vehicles Equipped with Automated Driving Systems Guidelines” is now in its second edition, and provides recommendations for ADS/ADAS program administration, vehicle safety considerations, driver licensing considerations, law enforcement considerations and additional considerations for issues including cybersecurity, data collection, low-speed automated shuttles, connected vehicles, and vehicle platooning. Key amongst its finding is that no true path forward will take place in a vacuum. The responsible management and rollout of new technology takes input from a wide range of stakeholders, all of which must play a role in heralding emergent vehicle technologies. AAMVA will publish its updated third edition of this important resource in the Summer of 2022.

Of primary importance in consideration of any federal legislation is the key role state and local governments provide in the safe integration of ADS and ADAS-equipped vehicles into existing transportation networks. Implementation of a successful AV policy requires finding the appropriate balance between cooperating partners, delineating the respective responsibilities, documenting accountability, and ensuring that appropriate funding and incentives are in place for desired outcomes. Federal, State and local government must approach these issues in a systematic and pragmatic manner to ensure that safety on our nation's roadways and streets is paramount.

Key amongst those considerations is the fact that current federal and state roles in safety are already prescribed. AAMVA urges that no additional preemption over state authority to regulate vehicles of any type be included in federal legislation. When something goes wrong with any new technology, federal resources are not primary responders to the scene of a crash. Should there be safety issues that need to be rectified, permitting agile response to enforcement and regulation without having to leverage the federal recall mechanism may be not only warranted, but necessary to save lives. There are sure to be issues between the design features of a vehicle on the assembly line, and how those vehicles interact in a mixed fleet under dynamic circumstances. For this reason, every stakeholder should play its part in safety, and all state and local response options should be preserved.

The responsible path forward does not require any shift in the current federal-state preemptive dynamic. States recognize federal oversight of design features and the establishment of safety standards. The work ahead simply requires adjusting those safety standards to accommodate vehicles that are performing the dynamic driving task.

While the current regulatory structure does not contemplate a vehicle as driver, AAMVA feels confident that the current preemption precluding a state from enforcing against an identical federal standard is all the preemptive authority the federal government needs to pursue future ADS/ADAS continuity goals. In the lack of such standards, which the states rely heavily on, the states must retain their ability to regulate and enforce against unsafe products.

AAMVA has offered comprehensive comment on the issues we feel are most important with respect to accommodating these technologies through numerous USDOT regulatory dockets. Those comments are available at www.aamva.org/AAMVA_Comments.

AAMVA again thanks the Committee for holding this important hearing and stands ready to assist in describing the framework for getting life-saving technologies on our roadways in the safest means possible.

**Statement of the American Property Casualty Insurance Association,
Submitted for the Record by Hon. Eleanor Holmes Norton**

Automated driver assistance system (ADAS) and automated driving system (ADS) technology is rapidly increasing automation of the driving function. As these innovations fundamentally change the nature of driving, property casualty insurers will have a key role to play in encouraging the safe and efficient introduction of advanced vehicle technology. To do so, insurers must have access to information and data to innovate and develop services, products, and pricing to support the new automotive technologies.

The American Property Casualty Insurance Association (APCIA) is the primary national trade association for home, auto, and business insurers. APCIA promotes and protects the viability of private competition for the benefit of consumers and insurers, with a legacy dating back 150 years. APCIA members represent all sizes, structures, and regions—protecting families, communities, and businesses in the U.S. and across the globe. Together, APCIA members write 54 percent of the automobile insurance in the United States.

As the Committee on Transportation and Infrastructure studies the deployment of automated vehicles, it is important that members of Congress understand the needs of the automobile insurance industry so that insurers can continue to efficiently provide protection to vehicle passengers and commercial vehicles. Today, the automobile insurance industry faces disruption on several fronts. While car accidents have been down during the pandemic with fewer drivers on the roads, the trend in recent years has, unfortunately, been an increase in the number of accidents, injuries, and deaths on our roads. These tragedies come at a time when vehicles are safer than ever due to better construction and crash avoidance technology. However, those same improvements that make vehicles safer also significantly increase the cost of repairs. The cost of medical care for auto accident victims is also increasing much faster than the rate of inflation.

While navigating these issues, insurers will be challenged to make fundamental changes in how they assess risk as the focus moves from the human driver towards the technology that operates the vehicle. While vehicle characteristics have always played a role in pricing auto insurance, assessing accident risk has primarily focused on drivers. Going forward, insurers will need to identify vehicles equipped with autonomous technology and have that identification reflected in motor vehicle

records and crash reporting to assess the risk of different automated or autonomous driving systems, just as they are able to differentiate between drivers today.

Similarly, when determining liability in an auto accident claims situation, the primary approach today is to interview the drivers. With autonomous vehicles, insurers will need access to recorded vehicle data to provide evidence of how an accident happened. APCIA believes that our current state-based system of determining liability for accidents and compensating victims should be able to adapt to the changing nature of the driving risk if vehicle data is accessible and in a form that allows for prompt accident investigation and resolution of claims.

Access to and sharing of automated or autonomous vehicle data is a critical issue, not only for insurers but for automotive technology developers, manufacturers, vehicle owners, and numerous other stakeholders. At a minimum, vehicle owners or lessees should have the ability to authorize access to vehicle data to third parties with whom they wish to share data for any reason and APCIA urges the committee to address this issue in legislation. This can be accomplished while protecting an individual's privacy and protecting developers' intellectual property. Also, establishing a single set of rules for data access and sharing as well as a standardized set of data elements that balances those interests, is critical.

Finally, APCIA supports the preservation of the current division of federal and state regulatory responsibilities for motor vehicles, with the federal government setting and enforcing safety standards for motor vehicles and recalls and setting requirements for large vehicles. The states should continue to have primacy on motor vehicle "rules of the road," liability issues, insurance requirements and regulation, as they do today.

APCIA thanks the committee for the opportunity to share our comments in connection with this hearing. In addition to these comments, we would also like to share our comments made to the U.S. Department of Transportation regarding DOT's Automated Vehicle Comprehensive Plan in the letter below.

MARCH 19, 2021.

U.S. Department of Transportation,
1200 New Jersey Avenue SE,
Washington, DC 20590-0001.

Submitted via Regulation.gov.

Re: Docket Number: DOT-OST-2021-0005
Automated Vehicles Comprehensive Plan, Request for Comments

TO WHOM IT MAY CONCERN,

Automated driving technology, which from an insurers perspective includes advanced driver assistance system (ADAS) and automated driving system (ADS) technology, is rapidly increasing automation of the driving function. As these innovations fundamentally change the nature of driving, property casualty insurers will have a key role to play in encouraging the safe and efficient introduction of advanced vehicle technology. To do so, insurers must have access to information and data to innovate and develop services, products, and pricing to support the new automotive technologies.

The American Property Casualty Insurance Association (APCIA) is the primary national trade association for home, auto, and business insurers. APCIA promotes and protects the viability of private competition for the benefit of consumers and insurers, with a legacy dating back 150 years. APCIA members represent all sizes, structures, and regions—protecting families, communities, and businesses in the U.S. and across the globe. Together, APCIA members write 54 percent of the automobile insurance in the United States.

While the Automated Vehicles Comprehensive Plan makes no direct mention of insurance, it does touch upon issues that are very important to APCIA members that write automobile insurance, including safety, information sharing, and appropriate division of oversight of automated driving system technologies between the federal government and the states.

PRIORITIZATION OF SAFETY: UPDATING FMVSS AND STANDARD TERMINOLOGY FOR ADS AND ADAS SYSTEMS

It is entirely appropriate that the department places safety at the center of its comprehensive plan. APCIA believes that safety standards applicable to automated vehicles must set clear expectations for the public and provide clear direction for technology developers and manufacturers for compliance.

As such, we believe that the existing Federal Motor Vehicle Safety Standards (FMVSS) should be updated to address vehicles with both automated driving systems (ADS) and advanced driver assistance technology (ADAS). APCIA also supports the concept of requiring manufacturers to submit self-certification of their technology and that that recall authority applies to these systems, as it does for conventional vehicles serving as the primary enforcement mechanism for the FMVSS.

APCIA believes that exceptions to existing auto safety laws and motor vehicle safety standards should be rare, limited to only the highest levels (i.e., fully autonomous) of automated driving and should clearly define the levels of automation to which the modification applies. Exceptions should not be made for collision protection standards.

APCIA strongly believes that there should be standardization of terminology used to describe both automated driver assistance (ADAS) and automated driving systems (ADS) used for highly automated or “self-driving” vehicles. Common terminology would also enable the public to have a clearer understanding of the technology and allow insurers to identify and differentiate systems by performance, a critical element for insurance product development and pricing. Standardized terminology would also facilitate education of the public on the proper way to use automated driving systems on an ongoing basis as the technology evolves should be a key element of any safety framework for automated driving systems and automated driver assistance systems.

PROMOTING COLLABORATION AND TRANSPARENCY: DATA ACCESS STANDARD AND DATA ELEMENTS

Access to and sharing of automated or autonomous vehicle data is a critical issue, not only for vehicle owners and insurers, but for automotive technology developers, manufacturers, vehicle owners and numerous other stakeholders. Safety, security, privacy, and protection of intellectual property are all important, but must be balanced with the need for third parties to access such data. At a minimum, vehicle owners or lessees should have the ability to authorize access to vehicle data to third parties with whom they wish to share data for any reason.

When determining liability in an auto accident claims situation, the primary approach today is to interview the drivers. With automated vehicles, insurers will need access to recorded vehicle data to provide evidence of how an accident happened. APCIA believes that our current state-based system of determining liability for accidents and compensating victims should be able to adapt to the changing nature of the driving risk, but only if vehicle data is accessible and in a form that allows for prompt accident investigation and resolution of claims.

The Comprehensive Plan continues to call for the private sector to identify opportunities for voluntary data exchange, but it’s becoming clear that manufacturers are reluctant to do so absent clear guidance on what their obligations are. Establishing a single set of rules for data access and sharing at the federal level, and a standardized set of data elements that balances the interests of all stakeholders is critical. One suggestion that APCIA supports is updating the current event data recorder (EDR) law to apply to automated vehicles with the department working with state motor vehicle regulators, and insurance regulators to develop a standard set of data elements.

RECOGNITION OF STATE REGULATION OF INSURANCE AND LIABILITY ISSUES

APCIA supports preservation of the current division of federal and state regulatory responsibilities for motor vehicles, with the federal government setting and enforcing safety standards for motor vehicles and recalls, setting requirements for large vehicles. The states should continue to have primacy on motor vehicle “rules of the road”, liability issues, insurance requirements and regulation, as they do today.

CONCLUSION

Automated driving technology holds great promise for the future, and implementing clear standards for safety, maintaining the current federal and state roles in regulating automated vehicle technology and ensuring that insurers have access to vehicle data on reasonable terms to efficiently handle claims, develop products and underwriting methods are an essential first step toward that future. APCIA and its members stand ready to assist the Department of Transportation and look for-

ward to working together to establish a regulatory framework for automated driving.

ROBERT PASSMORE,
Vice President, Auto and Claims Policy,
American Property Casualty Insurance Association.

Statement of the American Society of Civil Engineers, Submitted for the Record by Hon. Eleanor Holmes Norton

INTRODUCTION

The American Society of Civil Engineers (ASCE) appreciates the opportunity to submit a statement to the House Subcommittee on Highways and Transit for the hearing on *The Road Ahead for Automated Vehicles*.

Thoughtful planning and safe deployment are critical as these vehicles become a more prevalent part of the nation's transportation landscape. ASCE recommends industry and government representatives work cooperatively to establish national standards for the planning and deployment of transportation infrastructure associated with automated vehicles (AV). These standards will help guide the development of AV systems by the private sector while establishing a framework for local jurisdictions that plan and maintain infrastructure.

ASCE commends the House Subcommittee on Highways and Transit for hearing from a variety of vehicle industry leaders and transportation experts. Federal, state, and local government officials need to balance investments to preserve safety on existing systems while planning for the roadways of the future with consideration of autonomous vehicles.

ASCE'S 2021 REPORT CARD FOR AMERICA'S INFRASTRUCTURE

Every four years, ASCE publishes its Report Card for America's Infrastructure, which grades the nation's major infrastructure categories using an A to F school report card format. The most recent report card¹, released in March 2021, evaluated 17 categories of infrastructure and reflected an overall C- grade.

Roads earned a D on the report card, which recognized that the introduction of connected and autonomous vehicles represents a major technological shift. Although these technologies can provide an opportunity to increase safety and mobility, reduce congestion and carbon emissions, and improve land use, autonomous vehicles could also lead to extra stress on the transportation system if implemented incorrectly. Some 40 states have already either enacted legislation or issued executive orders on autonomous vehicles, and a national framework is necessary to prevent a patchwork of individual state-level policies.

SAFETY

AV technologies have the potential to improve safety at a time when roadway fatalities are a serious issue. The National Highway Traffic Safety Administration (NHTSA) released data² in October indicating 20,160 people died in motor vehicle crashes between January and June 2021. This figure marks an increase of 18.4% compared to the first half of 2020, in which 17,020 such fatalities were projected.

According to a Human Factors for Connected Vehicles study by NHTSA³, connected vehicle technologies have the potential to address up to 82% of crash scenarios with unimpaired drivers. These technologies could save a significant number of lives and prevent crash-related injuries, and help avoid tens of thousands of crashes each year.

There are several areas where technology can fill in the gaps of human performance and improve safety and mobility.

For example:

- Technology improvements can provide stability control, automatic braking, all-wheel drive, steering by wire, traction control, collision avoidance, blind spot warning systems, lane control, and automatic cruise control.

¹ <https://infrastructurereportcard.org/>

² <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813199>

³ <https://www.nhtsa.gov/sites/nhtsa.gov/files/812068-humanfactorsconnectedvehicles.pdf>

- Infotainment systems linked to cell phone technologies (e.g., Bluetooth and voice activated commands) in vehicles can reduce distracted driving (e.g., from texting, looking down at a phone for directions, searching for an address, etc.).
- AVs possess hardware and software collectively capable of performing some aspects of safety-critical control functions (e.g., steering, throttle, and braking) without direct driver input. AVs may use vehicle sensors, cameras, GPS, and telecommunications to obtain information to make decisions regarding safety-critical situations and act appropriately by effectuating control at some level. In this way, the AV infrastructure and the roadway infrastructure are interdependent.
- Vehicle to Everything (V2X) technologies are being developed and tested to prevent or mitigate crashes. V2X technologies must improve safety for the passenger and provide increased efficiency for existing infrastructure. Connectivity to 5G systems will be required and enough spectrum band must be preserved to support V2X technologies.
- ASCE has joined industry partners such as the American Association of State Highway and Transportation Officials (AASHTO) in supporting the preservation of the 5.9 GHz wireless spectrum on which connected vehicles using V2X technologies rely.

The recently enacted Infrastructure Investment and Jobs Act represents a substantial investment in surface transportation. The legislation contains a five-year, \$383.4 billion reauthorization of federal surface transportation, highway safety, transit, and rail programs and an additional \$110 billion for road and bridge programs. As this law is implemented, it will be important to make investments that enhance growing technology.

Consideration should be given to the following:

- As connected and automated vehicles (CAV) technology continues to develop, cooperative systems must be achieved through strong partnerships between vehicles manufacturers, infrastructure owners and operators, government entities, freight transport and logistics professionals, transportation safety groups, law enforcement, first responders, and other private sector representatives.
- Our nation's transportation infrastructure system needs to meet the growth and demands of CAV technology. Strong and resilient infrastructure must be in place to adopt new transportation technology.
- It is important to invest in the infrastructure system to ensure CAV technology is properly implemented. There must be a complete and properly maintained infrastructure system in order to maximize the safety benefits that CAV technology can provide.

CONCLUSION

ASCE thanks the House Subcommittee on Highways and Transit for hearing from a panel of experts on the subject of AVs.

AV technologies have the potential to improve safety and reduce motor vehicle crashes. These vehicles will continue to be a part of the nation's transportation landscape, and their appropriate use will be facilitated by national standards developed by government and industry leaders.

Statement of the American Traffic Safety Services Association, Submitted for the Record by Hon. Eleanor Holmes Norton

The American Traffic Safety Services Association (ATSSA) welcomes the opportunity to provide this Statement for the Record regarding automated vehicles and roadway safety.

Established in 1969, ATSSA is an international trade association which represents the manufacturers, distributors, and installers of roadway safety infrastructure devices. Comprised of approximately 1,500 member companies, ATSSA's mission is to advance roadway safety and achieve the policy priority of *Towards Zero Deaths*.

While the expanded use of connected and automated vehicle (CAV) technology is an exciting technological advancement, it is important for policy makers, automobile manufacturers, state departments of transportation, local governments, and other stakeholders to recognize that a critical focus needs to be the safe operation of these vehicles on this nation's roadways. The National Highway Traffic Safety Administration's (NHTSA) early estimate of traffic deaths in the first nine months of 2021 showed a 12 percent increase in fatalities. ATSSA members understand the poten-

tial safety benefits that can be realized from the use of CAVs—but these benefits will only be realized after thoughtful planning and strategic roadway safety infrastructure investments.

CASE STUDY

ATSSA has been on the forefront of examining specific types of modifications to existing roadway safety devices and systems that will be necessary to accommodate CAVs. For example, in 2018, ATSSA led a case study evaluating pavement marking widths in order to determine how they interact with CAV technology. This case study explored the effect of longitudinal pavement marking width on the detectability of preformed tape pavement markings by a machine vision (MV) based advanced driver assistance system (ADAS). More specifically, this research compared the performance of MV technology relative to 4-inch and 6-inch-wide pavement markings. An aftermarket advanced driver assistance lane departure warning (LDW) system was adapted such that the pavement marking detection confidence rating that the LDW algorithm assigned to each pavement marking was extracted. The detection confidence rating assigned to each pavement marking served as the measure of the detectability of the pavement markings. Variations of 4- and 6-inch-wide preformed pavement marking tape were manufactured and installed on a closed course testing area to simulate different levels of in-service markings. The testing included various combinations of lighting (daytime, nighttime, and nighttime with on-coming headlamp glare) and environmental conditions (dry and wet recovery). This research shows that the 6-inch-wide longitudinal preformed tape markings consistently improved MV detection performance under wet daytime conditions, which is critical since wet daytime conditions provide a significant challenge for the MV technologies tested.

Much more work needs to be done to fully understand the relationship between the vehicle and the roadway—and the potential need for increased investments needed in roadway safety infrastructure. Studies such as this should be part of an increased research and planning effort that will be necessary to support the safe integration of autonomous vehicles onto our roadway infrastructure system. Failure to prioritize roadway safety in the development of CAV deployment strategies could lead to an uptick in both motor vehicle crashes and fatalities—which could be the reality if an automated vehicle should fail to properly interact with a traffic signal, stop sign or pavement marking.

CONCLUSION

The American commuting pattern continues to change—changes exacerbated by the COVID-19 pandemic. The increase in bicycle and pedestrian traffic has highlighted the importance of safety for all transportation system users, including vulnerable road users. Ensuring that roadway safety infrastructure is in place to protect these commuters and all who use our roadways must also not be overlooked.

While connected and automated vehicles are an exciting addition to the roadway system, roadway safety needs to be considered every step of the way in the planning, development and deployment process. ATSSA stands ready to help make this technology a safe and successful part of the transportation future in this country.



Letter of February 1, 2022, from Bill Sullivan, Executive Vice President of Advocacy, American Trucking Associations, Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 1, 2022.

The Honorable PETER DEFAZIO,
Chair,

Transportation and Infrastructure Committee, U.S. House of Representatives.

The Honorable SAM GRAVES,
Ranking Member,

Transportation and Infrastructure Committee, U.S. House of Representatives.

The Honorable ELEANOR HOLMES NORTON,
Chair,

Subcommittee on Highways and Transit, U.S. House of Representatives.

The Honorable RODNEY DAVIS,
Ranking Member,

Subcommittee on Highways and Transit, U.S. House of Representatives.

DEAR CHAIRS DEFAZIO AND NORTON, AND RANKING MEMBERS GRAVES AND DAVIS: In anticipation of the Transportation and Infrastructure Subcommittee on Highways and Transit's upcoming hearing, "The Road Ahead for Automated Vehicles," the American Trucking Associations (ATA) would like to provide the trucking industry's recommendations and pillars for the establishment of sensible federal policy. ATA is the largest national trade association representing the U.S. trucking industry. Employing more than 7.9 million people and moving nearly 12 billion tons of freight annually, trucking is the industry most responsible for moving America's economy. It is no coincidence that an industry so essential to American productivity is at the forefront of its most exciting innovations. America's truckers stood up and delivered throughout the pandemic, ensuring the availability of life-saving vaccines and personal protective equipment, and keeping our grocery store shelves stocked. As we emerge from the pandemic, Americans expect their goods delivered even faster, cheaper, and more efficiently. Ongoing supply chain disruptions are exposing the need for greater flexibility to meet these new challenges. ATA believes automated driving systems (ADS) will significantly enhance the safety, efficiency, and productivity of the U.S. freight and logistics system.

The benefits of automation can be accelerated by committing the federal government to collaborations with private industry partners that preserve the widest pathways to commercialization. ATA appreciates the work of the U.S. Department of Transportation (DOT) to adapt Federal Motor Carrier Safety Regulations and Federal Motor Vehicle Safety Standards for automated trucks, and for their consideration of the interaction between automated vehicles (AVs) and roadway infrastructure. ATA believes that collaboration among stakeholders, with leadership and guidance from DOT, is critical for developing a unified national framework of laws and regulations to facilitate the safe development, testing, deployment, and operation of commercialized automated vehicles.

As work progresses on any such AV legislative or regulatory framework, ATA encourages Congress and DOT to adopt a multi-modal approach and prioritize commercial motor vehicles, heavy specialty vehicles, trailer-combination vehicles, and passenger vehicles equally. We strongly recommend that any legislation establishing federal oversight of the development and deployment of AV technologies consider all road users, including passenger vehicles, commercial trucks, buses, as well as the supporting infrastructure. To that end, ATA offers several guiding principles to promote the expeditious deployment of AV trucks in the U.S.:

1. *The federal government should take a leading role in setting policies that will help foster the nationwide deployment of AV technologies in trucking.* The trucking industry relies on interstate highways to facilitate the free flow of goods between states. Accordingly, it is important that state and local laws do not inadvertently create disparities that slow the adoption of these safety- and productivity-boosting technologies. A clear process and standards-setting role for the federal government that preempts state efforts to regulate vehicle design is critical for commercial AV development.
2. *The federal government's approach should follow technological maturity and industry best practices.* AV technology in trucking is developing rapidly—and demonstrations continue to show the promise of enhanced safety and efficiency benefits. DOT should work with ATA, including ATA's Technology & Maintenance Council, and other trucking industry representatives to incorporate industry best practices when developing guidance and regulations for ADS-equipped commercial motor vehicles. Industry best practices provide a vital

technical basis to assist the evolution of legislative and/or regulatory frameworks.

3. *The federal government should collaborate with industry to create performance-based standards that focus on objective testing and evaluation criteria for autonomous vehicles.* Requiring AVs to achieve an acceptable level of safety and performance, rather than requiring the use of specific technology, will focus regulations on risk management within specific operating environments. Government-industry interactions through the Voluntary Safety Self-Assessment (VSSA) process and the AV TEST Initiative provide DOT with information on a variety of approaches to ADS technology and operations from a cross-section of organizations testing ADS-equipped vehicles. This information will help DOT and other agencies develop policies, regulations, and/or guidance without inadvertently picking technological or operational winners or losers.

While some have raised concerns about the potential impacts of automation on the workforce, ATA expects that there will continue to be a significant role for drivers in trucking. Automation will iteratively help build the capacity of the nation's transportation system, but there will always be a need for professional drivers capable of navigating the challenges of trucking. Because of the complexity and diversity of the trucking industry, drivers will retain an essential role in the deployment of automated vehicles while benefiting from automated technologies that improve their safety and productivity. Drivers will remain essential for monitoring automated driving systems, manually driving outside the operational design domains of automation, securing cargo and hazardous materials, and interacting with customers, shippers, and receivers. With improved quality of life through these new technologies that enhance driver safety and productivity, more people will be attracted to the trucking industry and will help close the driver shortage gap, which is now 80,000 drivers and expected to top 160,000 by 2030.¹

ATA thanks the Highways and Transit Subcommittee for holding this important hearing and welcomes the opportunity to engage Congress on this critical issue. As policymakers contemplate AV policies and regulations, it is critical that the trucking industry's perspective is considered and that industry best practices are taken into account. ATA looks forward to continuing its engagement with stakeholder advisory groups and governmental entities, including the Federal Motor Carrier Safety Administration (FMCSA) and other operating administrations within DOT on automated vehicles. ATA will also continue working with state trucking associations, state legislators, and transportation officials as policies, regulations, and research emerge at all levels of government and academia nationwide.

Thank you for your thoughtful consideration and continued leadership.

Sincerely,

BILL SULLIVAN,

Executive Vice President of Advocacy, American Trucking Associations.

cc: U.S. House Transportation and Infrastructure Committee Members

Letter of February 14, 2022, from Jimmy Christianson, Vice President, Government Affairs, Associated General Contractors of America, Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 14, 2022.

The Honorable PETER DEFAZIO,
Chairman,

Committee on Transportation and Infrastructure, United States House of Representatives, Washington, DC 20515.

The Honorable SAM GRAVES,
Ranking Member,

Committee on Transportation and Infrastructure, United States House of Representatives, Washington, DC 20515.

RE: Hearing entitled, "The Road Ahead for Autonomous Vehicles"

CHAIRMAN DEFAZIO AND RANKING MEMBER GRAVES:

On behalf of the Associated General Contractors of America (AGC)—the leading association in the construction industry representing more than 27,000 firms, in-

¹American Trucking Associations. "ATA Chief Economist Pegs Driver Shortage at Historic High." October 25, 2021.

cluding America's leading general contractors and specialty-contracting firms—thank you holding this important hearing on the future of autonomous vehicles. Now, more than ever, in order to prepare for autonomous vehicles (AVs) and electric vehicles (EVs), we must strategically invest in road and bridge infrastructure to ensure that it is safe and ready for this emerging technology. States partners need flexibility in addressing unique transportation challenges, including the ability to prepare the nation's roadways for vehicle technology of the future. In addition, we must protect the user-fee system to ensure adequate funding for our nation's infrastructure.

As you know, funding for federal surface transportation programs is supported by revenues from motor fuels user fees, and other trucking user fees, which are deposited into the Highway Trust Fund. However, Congress has not adjusted the motor fuels user fees since 1993, and the purchasing power of these user fees has fallen significantly. In addition, improved vehicle fuel efficiency and the growing number of alternative fuel vehicles are further reducing revenues. These revenues are now insufficient to support current levels of funding.

In 2009, the National Surface Transportation Infrastructure Commission concluded that the U.S. needs a new approach to transportation infrastructure financing. The commission specifically notes that "direct user charges are the most viable and sustainable long-term, user pay option for the Federal government." There, the commission recommended moving to a vehicle miles traveled (VMT) fee or mileage-based user fee (MBUF). The VMT is a user charge based on miles driven in a specific vehicle as opposed to the current excise tax on fuel consumed. At its simplest, the fee would be cents per mile. A VMT would ensure that all users are paying their "fair share" to keep roads and bridges in a state of good repair regardless of the type of vehicle they drive. In the Fixing America's Surface Transportation (FAST) Act, Congress provided nearly \$95 million to states to undertake pilot programs to look at implementation of a VMT fee.

Last year, President Biden signed into law the Infrastructure Investment and Jobs Act (IIJA), which provided historic funding for our nation's infrastructure. Recognizing that it was now time to pilot this VMT concept at the national level, Congress included a national VMT pilot program in the IIJA. Many lessons were learned from these state pilots, and the national VMT pilot will continue to help answer questions including privacy protection, equity by income, geography, and vehicle type, cost of administration, and complexity of implementation. Advancement of a VMT system in the U.S. must include adequate system development, promotion of national awareness and improvement of public opinion, combining state and federal efforts into a unified national concept, demonstration of national leadership, and resolution of the key issues learned from the initial pilot programs.

Autonomous vehicles will require state and local governments to make additional investments in our infrastructure to ensure they can operate safely. This makes it even more important, as the country looks to advance to AVs and EVs, that we protect the user-fee system to ensure that we can adequately fund our nation's infrastructure for the future. If we do not, the solvency gap in the Highway Trust Fund between revenues and expenses will continue to increase, making it harder for Congress to pass long-term surface transportation reauthorizations. Congress will continue to struggle to piece together a multitude of pay-fors to cover the necessary general fund transfer in the absence of an innovative and reliable user-fee.

As stated, the rise in autonomous vehicles will require significant investment, including roadway safety enhancements that decrease dangerous traffic bottlenecks and improve pavement and marking conditions on roadways. As such, it is paramount that state and local governments are able to maintain needed flexibility in Congressionally directed transportation funding to address and prioritize this matter.

We applaud Congress for the passage of the IIJA. However, we must prepare for the next reauthorization to ensure that the investment in our infrastructure, like IIJA, becomes the new normal—not a once in a lifetime accomplishment. The most sensible way to transition from the motor fuel taxes would be to start these early adopters of AVs and EVs on VMT or another user fee. We thank you for the opportunity to weigh in on this important issue.

Sincerely,

JIMMY CHRISTIANSON,
Vice President, Government Affairs, Associated General Contractors of America.

Letter of February 17, 2022, from Michael Robbins, Executive Vice President of Advocacy, Association for Unmanned Vehicle Systems International, Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 17, 2022.

Chairwoman ELEANOR HOLMES NORTON,
Highways and Transit Subcommittee,
Transportation and Infrastructure Committee, 2167 Rayburn House Office Building,
Washington, DC 20515.

Ranking Member RODNEY DAVIS,
Highways and Transit Subcommittee,
Transportation and Infrastructure Committee, 2164 Rayburn House Office Building,
Washington, DC 20515.

DEAR CHAIRWOMAN HOLMES NORTON AND RANKING MEMBER DAVIS,

Thank you for holding the hearing titled “The Road Ahead for Automated Vehicles” on February 2, 2022. Congress has been in sore need of an update on the status of the automated vehicle industry, and I appreciate the oversight your Subcommittee conducted during this hearing. On behalf of the Association for Unmanned Vehicle Systems International (AUVSI), thank you for the opportunity to submit the following statement for the record.

AUVSI is the world’s largest nonprofit organization dedicated to the advancement of unmanned systems and robotics across domains and represents corporations and professionals from more than 60 countries involved in industry, government and academia¹. Included in our membership are companies in the vehicle automation sector, and specifically those businesses dedicated to automated goods movement technologies. Specifically, AUVSI represents companies working in automated trucking, automated low-speed delivery devices, and automated warehouse yard and internal warehouse robotics².

As a result, we were excited about the inclusion of industry witnesses who were able to update the Subcommittee on the status of the full range of automated vehicles (AVs), including automated trucking. Testing and deployment of automated commercial motor vehicles (CMVs) are continuing to gain traction in various states across the country, which is testament to the technology’s ability to streamline and strengthen the domestic supply chain, augment the human workforce, and increase efficiencies³.

A number of the witnesses raised the ever-worsening scourge of roadway fatalities and accidents. We too are saddened by the continued and heightened loss of life suffered by all road users. AVs can and should play a larger role in reversing that trend, coupled with other safety enhancement technologies and regulations. We urge this Subcommittee to take seriously the numerous safety benefits AVs represent; they will never drive drunk, speed, or get distracted from texting and as a result they will save lives⁴.

With that said, it is critical for all stakeholders to delineate between AVs and vehicles that are equipped with advanced driver assistance systems (ADAS). The latter technology also has a role to play in increasing roadway safety. However, it is important to distinguish that automated driving systems (ADS) and ADAS are not the same thing⁵. In fact, inaccurately conflating the two will lead—and has led—to injury and death. The terminology around these systems can be confusing and there is no doubt we all need to do a better job explaining why and how ADS and ADAS differ. We ask that this Subcommittee join other AV stakeholders in insisting that the technologies are characterized correctly.

The recent Standing General Order (SGO) issued by the National Highway Traffic Safety Administration (NHTSA) was also mentioned by witnesses. However, what was not mentioned was that the agency itself has not determined how and when the data companies are submitting will be made public. Their intent to release the information is clear, however any implications that industry is hindering public release of the information are untrue and delivered in bad faith. AUVSI, along with a number of other industry stakeholders, has requested clarity from NHTSA on how officials plan to release collected information. Yet, to date, NHTSA has not shared any information with us or any other stakeholders. We would strongly suggest that this Subcommittee encourage the agency to be more forthcoming on this point, since consumer awareness and trust is of paramount importance to AV companies.

¹ <https://www.auvsi.org/member-organizations-list/all>

² <https://www.auvsi.org/commercial-ground-advocacy-initiatives>

³ <https://www.auvsi.org/our-impact/level-4-cmv-deployment-map>

⁴ <https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety>

⁵ <https://www.cars.com/articles/what-does-ad-as-mean-442753/>

Finally, we were heartened to hear the labor representatives' express interest in working collaboratively with AV companies and associations to shape the future transportation workforce during the hearing. AUVSI is eager to continue conversations already in progress with labor unions, and we share their overarching goal of preparing today's workers for good-paying and long-lasting jobs of the future.

In fact, the industry already has meaningfully pursued relationships with career and technical education (CTE) providers to begin the process of transitioning existing skillsets. Nuro recently announced a groundbreaking initiative with De Anza College⁶, and TuSimple established an innovative program partnership with Pima Community College to train safety operators⁷. Over the last several years, Aurora has partnered closely with Montana State University's Gallatin College on their Associate of Applied Science (AAS) in Photonics and Laser Technology on their curriculum, and company representatives currently serve on the program's industry advisory board. AUVSI is working to enable other companies to pursue similar relationships with CTE providers and would encourage this Subcommittee to examine these examples further, and push for more like them.

Importantly, we ask that this Subcommittee sustain the momentum generated by this hearing and we would implore you to continue engaging with industry stakeholders on how Congress can create safe and responsible guidelines around the testing and deployment of AV technologies. This industry holds immense promise to positively affect every aspect of American life, and, on behalf of AUVSI and our member companies, I thank you for your leadership on this issue and look forward to future hearings and conversations. If AUVSI or any of our members can ever be of service, please do not hesitate to contact me at any time.

Sincerely,

MICHAEL ROBBINS,
*Executive Vice President of Advocacy,
Association for Unmanned Vehicle Systems International.*

**Letter of February 2, 2022, from Koustubh "K.J." Bagchi, Senior Director,
Federal Public Policy, Chamber of Progress, Submitted for the Record by
Hon. Eleanor Holmes Norton**

FEBRUARY 2, 2022.

The Honorable PETER A. DEFAZIO,
*Chairman,
House Committee on Transportation and Infrastructure, 2165 Rayburn House Office
Building, Washington, DC 20515.*

The Honorable ELEANOR HOLMES NORTON,
*Chairwoman,
Subcommittee on Highways and Transit, House Committee on Transportation and
Infrastructure, 2165 Rayburn House Office Building, Washington, DC 20515.*

The Honorable SAM GRAVES,
*Ranking Member,
House Committee on Transportation and Infrastructure, 2165 Rayburn House Office
Building, Washington, DC 20515.*

The Honorable RODNEY DAVIS,
*Ranking Member,
Subcommittee on Highways and Transit, House Committee on Transportation and
Infrastructure, 2165 Rayburn House Office Building Washington, DC 20515.*

DEAR REPRESENTATIVES DEFAZIO, NORTON, GRAVES, AND DAVIS:

Chamber of Progress appreciates the opportunity to submit a statement for the record for the hearing entitled, "The Road Ahead for Automated Vehicles," held by the House Committee on Transportation and Infrastructure on February 2, 2022. Chamber of Progress is a new progressive tech industry group fighting for public policies that will build a fairer, more inclusive country in which all people benefit from technological leaps. Our partners include a number of autonomous vehicle (AV) companies, but our partner companies don't have a vote or veto over our positions.

⁶ <https://www.deanza.edu/autotech/av>

⁷ <https://www.pima.edu/news/press-releases/2019/201906-tu-simple.html>

AVS WILL REDUCE TRAFFIC FATALITIES, EXPAND ACCESS TO SENIORS AND DISABLED, IMPROVE EMISSIONS

There are many benefits that AVs can provide to society. *AVs can provide access to people with disabilities and the elderly.* A Bureau of Transportation Statistics survey found that six million people with disabilities lack access to the transportation they need, limiting their ability to find job opportunities and see loved ones.¹ AV companies have the opportunity to make transportation much more accessible from the start by accounting for a number of impairments, including visual and mobility, in their design within all of their fleets.

Additionally, studies forecast that *AVs could reduce greenhouse gas emissions from cars and trucks*—the biggest source of transportation emissions—by 80 percent.² Most AVs will be electric, and many others are hybrids. That's largely because electric vehicle (EV) technology and AV technology complement one another. Electric vehicles are easier for computers to control than traditional vehicles, and combining EV and AV technology maximizes cost and fuel savings. Plus, AVs drive more efficiently than humans can.

Finally, deploying AVs on the road now *could save hundreds of thousands of lives over the long term* as the technology continues to become more advanced every year.³ Research shows that 90 percent of car crashes are caused by human error. By eliminating human error, AVs can make our roads safer. Studies suggest that putting AVs on the road now could save hundreds of thousands of lives over the long term.⁴

PUBLIC SUPPORT FOR AVS IS STRONG

The time is now to support robust AV deployment. In fact, a survey commissioned last fall by Chamber of Progress found that there is support for the deployment of AVs.⁵

The survey found that 53% of voters are ready to increase autonomous vehicle testing and deployment, and 53% are ready to ride in an AV either now or in the next five years. A larger majority of those surveyed (63%) believe there are major benefits to AVs including accessibility and independence for non-drivers, including wheelchair users, the blind, seniors, and those living in transportation deserts.

In fact, the same polling showed that a majority of adults support AVs being tested in their state. Narrowing the results to respondents in Western states including California, the poll found that 58% of respondents favored local AV testing.

For Democrats and union members, support was even higher; 60% of Democratic voters and 75% of labor union members support AV testing in their state.

AVS HAVE THE POTENTIAL TO SPUR NEW JOB CREATIONS AND FILL IN TURNOVER GAPS

In addition to the jobs created by increasing efficiency in the transportation and logistics industries, widespread use of AVs can increase demand for maintenance and IT professionals. To meet this demand, companies like Nuro have partnered with community colleges to create technician training programs.⁶ Additionally, companies like Waymo, Zoox, and Cruise have hired remote human operators to assist their vehicles and improve passenger experience.⁷

The Department of Transportation also predicts that AVs can improve working conditions in existing transportation jobs by reducing the risk of accidents and shifting demand toward last-mile services and short trips.⁸ For long-haul truckers, this could mean fewer nights spent sleeping in truck cabs and more time on deliveries

¹ https://www.bts.gov/archive/publications/special_reports_and_issue_briefs/issue_briefs/number_03/entire

² <https://e360.yale.edu/features/will-self-driving-cars-usher-in-a-transportation-utopia-or-dystopia>

³ <https://www.rand.org/blog/articles/2017/11/why-waiting-for-perfect-autonomous-vehicles-may-cost-lives.html>

⁴ <https://www.rand.org/blog/articles/2017/11/why-waiting-for-perfect-autonomous-vehicles-may-cost-lives.html>

⁵ <https://progresschamber.org/morning-consult-poll-dems-biden-voters-union-members-support-autonomous-vehicles/>

⁶ https://www.losaltosonline.com/schools/de-anza-college-introduces-autonomous-vehicle-training-program/article_ffbd1d4c-57b6-11e-c-b9db-3f562772a842.html

⁷ <https://www.bloomberg.com/news/newsletters/2021-08-10/driverless-cars-are-proving-to-be-job-creators-at-least-so-far>

⁸ <https://www.transportation.gov/sites/dot.gov/files/2021-01/Driving%20Automation%20Systems%20in%20Long%20Haul%20Trucking%20and%20Bus%20Transit%20Preliminary%20Analysis%20of%20Potential%20Workforce%20Impacts.pdf>

close to home. Driverless vehicles would also cut down the amount of turnover the trucking industry faces as most drivers are of retirement age or close to it.

Finally, the Department of Labor and its state partners have created job transition and retraining programs to assist those affected by the introduction of autonomy. These entities help drivers adapt to new technologies and market conditions, helping them find gainful employment. By utilizing these driverless vehicles, involuntary job losses would be reduced.

GOVERNMENT INVESTMENT IS NEEDED TO ENSURE A ROBUST FUTURE WITH AVS

The timeline to a full transition to fully autonomous driving is unknown and difficult to predict, but the importance of ensuring a robust skilled workforce is critical to realizing the full benefits of AV technology. Governments at all levels have a real opportunity to not only ensure that innovation in this field flourishes, but also to help *secure the future for current commercial drivers who are prepared to enter new roles*. Furthermore, any new entrants should have robust opportunities to gain necessary training and skills.

There is real *opportunity for governments to play a major role* in helping commercial drivers prepare for an autonomous vehicle future. For example, Congress could establish grant programs to incentivize new entrants into training programs focused on roles established by evolving AV technology. As referenced in Senator Gary Peters' Workforce DATA Act,⁹ Congress could also pass a provision that measures the impact of automation on the workforce in order to inform workforce development strategies in the AV industry. Finally, Congress could pass legislation to direct the National Academies to study how to measure the impact of automation on the workforce, including job creation, job displacement, job retention, and skill shifts.

As industries evolve, it is important to build incentives for interested individuals to begin training for future positions that will be established under an AV workforce; however it is just as important to enhance or establish relevant programs that will respond to any potential job loss or job displacement.

Furthermore, the full array of roles that will be available under an AV workforce have yet to be determined. Therefore, fully understanding what potential positions may be created through industry evaluations and studies will be important in bolstering training programs and incentivizing new workers to join the industry.

Our country has undergone industrial change based on technological innovations for over a century. Now is the time to apply those lessons and develop creative and efficient avenues of ensuring that workers are prepared for a future with fully utilized AV technology.

Thank you for your leadership on this important issue and for holding this hearing.

Sincerely,

KOUSTUBH "K.J." BAGCHI,
Senior Director, Federal Public Policy, Chamber of Progress.

Letter of February 17, 2022, from Consortium for Citizens with Disabilities Transportation Task Force Cochairs, Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 17, 2022.
Via electronic mail.

The Honorable ELEANOR HOLMES NORTON,
United States House of Representatives,
2136 Rayburn House Office Building, Washington, DC 20515.

The Honorable RODNEY DAVIS,
United States House of Representatives,
2079 Rayburn House Office Building, Washington, DC 20515.

DEAR CHAIR NORTON AND RANKING MEMBER DAVIS,
The Consortium for Citizens with Disabilities (CCD) Transportation Task Force Co-Chairs write to provide comment on issues addressed in the February 2, 2022 Highways and Transit subcommittee hearing "The Road Ahead for Automated Vehicles." CCD is the largest coalition of national organizations working together to advocate for Federal public policy that ensures the self-determination, independence, empowerment, integration and inclusion of children and adults with disabilities in

⁹ <https://www.congress.gov/bill/116th-congress/senate-bill/1738>

all aspects of society free from racism, ableism, sexism, and xenophobia, as well as LGBTQ+ based discrimination and religious intolerance.

The CCD Transportation Task Force developed Autonomous Vehicle (AV) principles in December 2018¹. Signatories to the Principles included 22 national organizations. The Principles were submitted to the US Department of Transportation (USDOT) in response to its request for comment on its AV 3.0 guidance. The Task Force also submitted detailed feedback in 2019 on issues to be addressed in a bicameral, bipartisan self-driving car bill. Please find the feedback attached.

During the February 2nd hearing there was acknowledgement that AVs could expand mobility access for people with disabilities. Nearly 1 in 5 people in the U.S. has a disability (more than 57 million). *In 1990, Congress passed the bipartisan Americans with Disabilities Act (ADA). In enacting the ADA, Congress sought to “provide a clear and comprehensive national mandate for the elimination of discrimination against individuals with disabilities.”* As a result, 99% of public buses are equipped with ramps, far more curb ramps benefit the public, and there is improved provision of accessible transit to people with sensory disabilities. *Yet, significant barriers to accessible, affordable transportation remain across modes.*

Many people with disabilities are currently unable to obtain a driver license, and cannot afford to purchase an accessible vehicle. Without affordable, accessible transportation people with disabilities are unable to travel to work, to school, to contribute to and participate in their communities, to support and spend time with family and friends, and live their lives to the fullest.

AVs have the potential to drastically improve access for people with disabilities, including members of the blind and low vision, deaf and hard of hearing, intellectual, developmental and cognitive disability communities, people with physical disabilities, including wheelchair users, and people with neurological conditions including epilepsy and seizure disorders. However, the promise and safety of AVs will only be realized if the vehicles and the surrounding infrastructure are fully accessible, and the safety elements consider the needs of all people with disabilities.

We ask you to consider the following priorities, and to refer to our full responses submitted in 2019:

- First and foremost, legislation should require full accessibility for all types of common and public use electric and autonomous vehicles. Full accessibility, or inclusive design of a vehicle, ensures usability by people with sensory, physical, cognitive and neurological disabilities, including wheelchair users.
- Licensing discrimination on the basis of disability must also be prohibited.
- Infrastructure must be improved for AVs to maximize their benefits. Walk and rollability and access to vehicles for all will require accessible public rights of way such as sidewalks, curb cuts, accessible pedestrian signals, drop-off/pick-up points and cross walks. Funding for these improvements should prioritize underserved communities with the greatest need, and would provide much needed access and mobility for travelers with disabilities in the short and long term.
- Passenger safety should be protected by ensuring health and disability status and locations visited is not shared or used for commercial or tracking purposes without permission of the individual.
- We encourage studies examining the potential impacts on transportation and land-use patterns, congestion, pollution, road safety and public transit, members of low income, disability and Indigenous communities and communities of color.
- Finally, as you take seriously the needs of workers who may be impacted by the transition to both electric vehicles and AVs, and consider funding for training and new jobs, we ask you to ensure inclusion of workers with disabilities.

Thank you again for the opportunity to provide comments regarding the road ahead for AVs. Please do not hesitate to contact Carol Tyson with any questions. We look forward to supporting the work of the Committee on this important topic. Thank you for your commitment to ensuring people with disabilities benefit from, and are included in, the future of mobility.

¹ Consortium for Citizens with Disabilities Transportation Task Force Autonomous Vehicle Principles. December 3, 2018. Available at <http://www.c-c-d.org/fichiers/CCD-Transp-TF-AV-Principles-120318.pdf>

Sincerely,

CONSORTIUM FOR CITIZENS WITH DISABILITIES
 TRANSPORTATION TASK FORCE CO-CHAIRS
Sarah Malaier, American Foundation for the Blind.
Swatha Nandhakumar, American Council of the Blind.
Claire Stanley, National Disability Rights Network.
Carol Tyson, Disability Rights Education & Defense Fund.

Letter of February 1, 2022, from Gary Shapiro, President and CEO, Consumer Technology Association, Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 1, 2022.

Chairwoman ELEANOR HOLMES NORTON,
Highways and Transit Subcommittee,
Transportation and Infrastructure Committee, 2167 Rayburn House Office Building,
Washington, DC 20515.

Ranking Member RODNEY DAVIS,
Highways and Transit Subcommittee,
Transportation and Infrastructure Committee, 2164 Rayburn House Office Building,
Washington, DC 20515.

DEAR CHAIRWOMAN HOLMES NORTON AND RANKING MEMBER DAVIS,

Ahead of the February 2, 2022, Highways and Transit Subcommittee hearing examining “The Road Ahead for Automated Vehicles,” we highlight how self-driving vehicle technology is improving American lives and advancing U.S. competitiveness.

The Consumer Technology Association’s (CTA)® members are the world’s leading innovators—from startups to global brands—helping support more than 18 million American jobs, including many who are working to make the transportation system safer with self-driving vehicles. Our membership includes a wide range of companies working to bring self-driving vehicle innovations to America’s roadways. This includes vehicle and component manufacturers, software developers and transportation platforms engaged in a multidisciplinary approach to this emerging and growing industry.¹

Self-driving technology benefits have become clearer over the past few years. As our nation continues to feel the impact of COVID–19, self-driving vehicles help provide safe and contactless deliveries of food, medicine, and medical prescriptions to Americans in need.² Self-driving shuttle vehicles transport COVID–19 tests at major hospitals and clinics.³ Additionally, many self-driving truck companies provide a free service for food banks in Texas, Arizona, and Ohio.⁴

The benefits and usage of self-driving vehicles has gone way beyond the applications to assist during the pandemic. The self-driving vehicle industry has made incredible advances in technology and deployed more vehicles in a safe, thoughtful and measured manner. Companies are safely deploying vehicles in California Michigan, Colorado, Texas, Florida, and many other states across the country.⁵ Consumers can use ride-hailing self-driving vehicle services in Arizona.⁶ Self-driving truck companies are operating on public roads.⁷

Self-driving vehicles will improve productivity, cut road congestion and make transportation cleaner and more efficient. They will provide undreamed of independence, accessibility and mobility to seniors and people with disabilities. Most importantly, they will reduce roadway fatalities, the vast majority of which (94%) are caused by human error.

Americans want these benefits. CTA research illustrates that consumers desire safety improvements, better mobility and less time wasted in traffic. Almost two-thirds of Americans surveyed are interested in replacing their cars with self-driving

¹ Self-Driving Vehicles: Consumer Sentiment 2021—Consumer Technology Association® (cta.tech)

² <https://www.nhtsa.gov/coronavirus-resources-nhtsa/coronavirus-innovative-automotive-technologies>

³ Id.

⁴ Id.

⁵ <https://www.dmv.ca.gov/portal/news-and-media/117199-2/>; <https://www.nhtsa.gov/automated-vehicle-test-tracking-tool>;

⁶ <https://www.bloomberg.com/news/articles/2022-01-14/my-rides-in-a-fully-driverless-waymo>

⁷ <https://techcrunch.com/2021/12/29/tusimple-completes-its-first-driverless-autonomous-truck-run-on-public-roads/>

vehicles.⁸ Also, a recently study on automated trucking by the Volpe Center made clear the economic benefits of the technology.⁹

As Congress discusses competitiveness legislation, automated transportation is key to America's future economic success. Self-driving technology is the subject of fierce global competition. China prioritized autonomous transportation in its high-tech infrastructure program. The EU and other nations are also aggressively moving forward. The nation that wins this race will claim the economic benefits and high-skill jobs that self-driving vehicles produce—from the manufacturing of advanced sensors to the development of new artificial intelligence technologies. Our infrastructure must allow for the advancement of self-driving vehicles.

Realizing the rewards of self-driving innovation will require thoughtful, forward-thinking and targeted policies. However, even as self-driving applications advance, American national testing and deployment are thwarted by a maze of conflicting state rules, legacy testing restrictions and federal limitations. That is why CTA worked with the U.S. House on the SELF DRIVE Act and the House Energy and Commerce Committee on legislative initiatives to promote the safe but robust American rollout of self-driving vehicles.

Creating rules to capture the benefits of automated transportation will require commitment, vision and flexibility. We encourage the House to prioritize innovation and safety to allow this cutting-edge technology to flourish.

Congress recently passed infrastructure legislation—which CTA wrote to the President in support of the principles within the legislative framework¹⁰—and we encourage you to consider ways to support American innovation, remove unnecessary roadblocks and create a clear and practical regulatory path that allows this next-generation technology to advance in the U.S. Such efforts could include directing the National Highway Traffic Safety Administration to revise outdated Federal Motor Vehicle Safety Standards and encouraging states to harmonize their self-driving and traffic regulations to avoid a state patchwork of conflicting laws.

CTA offers the House its resources and comprehensive expertise in this effort. We welcome the opportunity to participate in conversations about advancing automated transportation and putting America in the driver's seat for global technology leadership.

Sincerely,

GARY SHAPIRO,

President and CEO, Consumer Technology Association.

cc: Members of the U.S. House Committee on Energy & Commerce

Statement of Kenneth W. Stuebing, BHSc, CCP(f), FO IV, President and Board Chair, International Association of Fire Chiefs, Submitted for the Record by Hon. Eleanor Holmes Norton

As President and Board Chair of the International Association of Fire Chiefs (IAFC), I am grateful to the subcommittee for holding this important and timely hearing on autonomous vehicles (AV). I appreciate the opportunity to submit the following statement on the IAFC's behalf.

The IAFC represents the leadership of over 1.1 million firefighters and emergency responders. IAFC members are the world's leading experts in firefighting, emergency medical services, terrorism response, hazardous materials (hazmat) incidents, wildland fire suppression, natural disasters, search and rescue, and public-safety policy. Since 1873, the IAFC has provided a forum for its members to exchange ideas, develop best practices, participate in executive training, and discover diverse products and services available to first responders.

America's fire and emergency service is an all-hazards response force that is locally situated, staffed, trained, and equipped to respond to all types of emergencies. There are approximately 1.1 million men and women in the fire and emergency service—consisting of approximately 300,000 career firefighters and 800,000 volunteer firefighters—serving in over 30,000 fire departments around the nation. They are trained to respond to all hazards ranging from automobile accidents, earthquakes, hurricanes, tornadoes, and floods to acts of terrorism, hazardous materials incidents, technical rescues, fires, and medical emergencies. We usually are the first on the scene of a disaster and the last to leave.

⁸Supra, note 1.

⁹<https://rosap.ntl.bts.gov/view/dot/54596>

¹⁰[cta-letter-to-wh_bipartisan-infrastructure-goals-7-22-21_1.pdf](#).

The IAFC has been active in examining the effects of the deployment of AVs on the nation's roads and highways. Both IAFC members and staff have attended multiple Federal Highway Administration National Dialogue meetings. The IAFC has met with National Highway Traffic Safety Administration (NHTSA), AV manufacturers and state officials to discuss traffic safety and other issues relating to AV deployment issues.

With numerous statistics stating that most traffic accidents are caused by human error, the IAFC sees great promise in the deployment of AVs. However, the IAFC also wants to better understand how AVs will interface with emergency responders. The IAFC recommends that the House of Representatives' Committee on Transportation and Infrastructure work to develop national standards to address interactions between AVs and emergency responders along with AV actions during traffic accidents. Specifically, the committee should focus on establishing national standards for AV manufacturers to ensure AVs yield to emergency vehicles on the highways and recognize the many different local and state regulations that may be in place in the various jurisdictions through which AVs travel. AVs should be able to react properly to malfunctioning traffic signals and preemption systems, poorly marked roads or vandalized road signs. AVs must also be able follow hand signals by emergency responders that are meant to control or direct traffic.

The committee should also focus on establishing national standards for AV manufacturers to ensure that an AV can be properly identify when it has been involved in an accident, and whether the accident involves another AV or non-AV vehicle, animal, bicyclist or pedestrian. Standards also should be enacted to ensure an AV's engine shuts off automatically in such accidents and the ability for emergency responders to physically disable the vehicle if needed. AV manufacturers should also be required to dialogue with first responders on their interactions with AVs and develop emergency response guidance for first responders to address the unique response challenges AVs may present, especially when there are lithium-ion batteries involved. Manufacturers also should provide education to first responders and help them prepare for the deployment of these vehicles in their communities. AV manufacturers also should take steps to educate the public on the various autonomous capabilities of an AV they may operate, whether these capabilities consist of basic driver assist features or more automated systems with little or no human control needed.

For areas where AV manufacturers intend to deploy fleets for transportation, the IAFC would like AV manufacturers to notify local fire, EMS and law enforcement organizations before deploying vehicles in their jurisdictions. These notifications should include where the AVs will be deployed, the number of AVs being deployed, the hours the AVs will operate, the level of automation the AVs will have, their expected performance in inclement weather, how the AVs are expected to respond to various traffic incidents, how accidents involving AVs will be handled, and how the public will be notified about such accidents.

If AVs are used for freight transportation, the IAFC would like to see special protocols and training be developed for transporting hazardous materials shipments. Additionally, AVs transporting hazardous materials should have electronic shipping papers, so first responders can be aware of the type and quantity of hazardous materials they may encounter at an emergency scene involving an AV.

Both AV manufacturers and first responders will have to be prepared to invest a lot of time and effort to ensure the proper rollout of AVs within each emergency jurisdiction. Fire departments will have to ensure that all fire stations in the operational area (and their mutual aid partners) are trained to recognize and respond to emergencies involving AVs. AV Manufacturers and local responders will have to work on closed courses to test the AVs and help the AVs to learn to recognize human directions and even the sound of the various sirens employed by local emergency responders' vehicles.

The IAFC is also concerned about potential false alarms where an AV will call a 9-1-1 Public Safety Answering Points (PSAP) accidentally to inform them of an accident that didn't occur. To ensure against these false notifications the IAFC recommends that AV operations centers reach out to PSAPs if there is a traffic accident.

Finally, the IAFC is pleased to see the committee's engagement regarding 5.9 GHz spectrum and recommends that the committee continue to monitor and oppose the FCC's decision to reallocate usage of the lower 45 MHz of the 5.9 GHz band to unlicensed operations. It is important that the FCC reconsider this decision and retain 75 MHz of 5.9 GHz spectrum for vehicle-to-everything (V2X) communications. The retention of this spectrum for V2X will be key in facilitating the technologies that will enable AVs to properly communicate with roadways, emergency vehicles and other AVs. The IAFC strongly believes that the safe and successful deployment

of AV technology will directly depend on there being sufficient spectrum available for V2X applications.

On the behalf of the IAFC I thank the subcommittee for the opportunity to submit this statement on the key issues to consider as AV technology advances and more AV vehicles are tested and introduced on America's roadways. The IAFC looks forward to continuing to work with the subcommittee to ensure that AV deployment and development will involve the active consultation of first responders, so this promising technology can realize its full potential in improving the safety of America's roadways.

Thank you, Merci, Wela'lloq.

Statement of ITS America, Submitted for the Record by Hon. Eleanor Holmes Norton

ITS AMERICA: EQUITY, CLIMATE, SAFETY, AND INFRASTRUCTURE PRINCIPLES FOR
AUTOMATED AND AUTONOMOUS MOBILITY

Introduction

More than 38,000 people died on US roads in 2020. Our cities, the engine of the U.S. economy, are revving once again, leading to increased congestion. Some interstates divide our communities. The transportation sector is responsible for 29 percent of the country's greenhouse gas emissions. Our highways and bridges, built largely between the mid-1950s to 1970s, are crumbling and struggling to move goods and people with the efficiency required by the technology-driven global economy.

Twenty-one years into the 21st century, automated and autonomous vehicles (AVs) present us with a generational opportunity to reimagine our transportation system and transform outcomes—saving tens of thousands of people, reducing greenhouse gas emissions and congestion, and leading to more vibrant, equitable places.

Critical to achieving this future is the federal government putting in place national regulatory frameworks and investments for the physical and digital infrastructure with developers of AV technology around areas such as equity, climate, safety, and intelligent infrastructure, as the technology moves from expanded pilots to full deployment of AV fleets. AVs present significant opportunities to expand mobility for people who currently have limited transportation options and increase access to mobility more broadly.

ITS America's Automated Vehicle Standing Advisory Committee established task forces on equity, climate, safety, and infrastructure to develop a set of principles to ensure AV benefits are broadly realized. The resulting principles are intended to inform federal programs, regulations, and recommend best practices that can be implemented today and in the future.

Principle Recommendations

Improving Transportation Safety

1. Laying the groundwork for the transformation of our nation's transportation systems and communities starts with safety. ITS America supports enacting a federal regulatory framework to accelerate and guide AVs' continued safe development and deployment, establishing a national AV pilot program, and enacting innovative regulatory approaches while ensuring compliance with state and local traffic laws and rules, and an improved exemption petition process. We urge the U.S. Department of Transportation (USDOT) to promote comprehensive public education that can be uniformly messaged across industry, research, and government sectors to advance responsible public education and marketing, including awareness of the capabilities and limitations of AVs and the transition from Advanced Driver Assistance Systems (ADAS) to Automated Driving Systems (ADS). We call on the USDOT to provide the National Highway Traffic Safety Administration (NHTSA) with adequate resources, funds, staff, and public message resources to guide the safe development and deployment of AVs, including funding to work with industry, state, and local governments on regulations and laws that may need to be updated to address AVs, and work with industry, government, and research sectors to develop shared AV terminology for engineers, policymakers, and consumers with precise definitions that the public can understand.

Expanding Transportation Equity

2. Both the public and private sectors' thoughtful integration of AVs can lead to more affordable, accessible, and equitable mobility access and delivery options for underserved and low-resourced communities. ITS America supports conducting or encouraging pilot programs and research activities in Areas of Persistent Poverty (APP) within state and local AV testing and deployment sites, which will allow these communities to experience the technology and develop a thorough understanding of opportunities for AVs to deliver more equitable transportation outcomes.
3. ITS America supports the integration of AVs with other pilot programs focused on enhancing equity, such as programs that provide subsidized access to transit and transit-integrated Mobility on Demand (MOD) and Mobility-as-a-Service (MaaS) programs, and Universal Basic Mobility (UBM), including mobility wallets. This integration should include a focus on increasing job access or increasing investment in public transit services and providing transit agencies with increased flexibility to fund smart transit technologies that support first-mile/last-mile connections, including integrating shared ride services and flex routes to increase access in APP. ITS America supports increased federal and state research for AV pilot funding for rides and deliveries that demonstrates innovation and learnings, with an emphasis on programs that enhance mobility for areas of persistent poverty, individuals with disabilities, older adults, communities of color, tribal communities, unbanked and underbanked populations, rural communities, food deserts, and pharmacy deserts.
4. ITS America supports developing criteria to evaluate and prioritize AV pilot program selection on the priorities identified in USDOT Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grants funding directives.

Accessible Transportation

5. ITS America supports accelerating the modernization of federal regulations to allow for the implementation of new vehicle designs, technologies, and capabilities that improve accessibility and equitable access while complying with state and local traffic laws and rules.

ITS America urges NHTSA to modernize federal motor vehicle safety standards (FMVSS) to allow for the safe introduction of AVs with innovative designs, including vehicles that are designed from the ground up for purposes such as accessible personal transportation, connections to mass transit, and facilitating deliveries. ITS America urges NHTSA to use its statutory authority while FMVSS are being updated to issue exemptions for vehicles with novel designs that are safe. NHTSA should streamline the process for considering FMVSS exemption petitions. Reducing regulatory uncertainty and providing greater clarity will enable manufacturers to introduce new types of AVs that will enhance USDOT's base of knowledge on the safety, efficiency, and equity benefits of AVs with novel designs—while informing ongoing and future rulemakings and complying with state and local traffic laws and rules.
6. ITS America supports accessible and barrier-free universal design practices for AVs and infrastructure. USDOT should work with automakers, wheelchair devices manufacturers, and stakeholders to advance the development of design standards that will provide regulatory clarity and guidance to assist in building accessible AV designs for wheelchair securements including wheelchair self-securement. Ultimately, USDOT should work to increase the overall number of vehicles that can be operated and ridden by wheelchair users without extensive modification. It should also convene relevant government agencies to explore ways to modify existing regulations to allow for greater access to crash tested and transit compatible wheelchairs. USDOT should work with AV developers and infrastructure owners and operators to coordinate vehicle and infrastructure design. AVs can significantly enhance mobility options for individuals without a driver's licenses—especially people with disabilities and older adults. However, many states require a licensed driver to be present when a vehicle is being operated. USDOT should work with states to ensure that unlicensed individuals are not prevented from using fully automated vehicles that do not require human intervention (SAE Level 4 and 5) while complying with state and local traffic laws and rules.
7. ITS America supports disseminating best practices to ensure that learnings from publicly funded pilot programs are broadly shared. ITS America supports the exchange of best practices and learnings pertaining to vehicles' design and development, transportation operators and providers, impact on communities, and impacts on underserved and vulnerable populations where AVs are in a

position to enhance management of mobility, promote the creation of innovative planning tools, and create positive outcomes.

Sustainable Transportation

8. ITS America supports AVs and alternative and sustainable fuels policies that support and supplement, not replace, high-efficiency modes of transportation such as public transit; it also supports multimodal, growth management, and transportation demand management (TDM) objectives. ITS America supports AV policies that will prioritize higher occupancy trips and modes made by AVs that will reduce vehicle miles traveled, including ride-hailing AV fleets and policies that increase vehicle utilization rates, decrease the need for vehicle parking to reclaim and repurpose real-estate for other purposes, and doesn't require roadway expansion. ITS America supports combining AV technology with V2X connectivity, according to well-developed technical standards, to save energy and reduce emissions through more efficient driving speed profiles and aerodynamic drag reductions for AVs, regardless of their powertrain technology.

Advancing Electrification Goals

9. ITS America urges Congress to eliminate the statutory obstacles to electric vehicle charging on federal-aid highway right of way and increase funding for publicly accessible electric vehicle charging infrastructure and the electric grid that will be accessible to all drivers of electric vehicles. ITS America supports the development of recyclable and environmentally-friendly battery technology, incentivizing a domestic recycling industry, reducing the amount of rare-earth materials needed to build batteries, and research into renewable recyclable materials that are still crash-worthy and produce fewer greenhouse gas emissions. ITS America supports policies that encourage widescale adoption of zero-emission vehicles (ZEVs) including tax credits for manufacturing of ZEVs; incentives for consumers, especially low-income consumers, to purchase ZEVs; tax credits for the purchase of EV charging equipment, including for residential, commercial, multi-family condo, and apartment complexes; funding for zero-emission infrastructure; and credits for AV/ZEVs that are shared use.¹

Modernizing America's Infrastructure

10. ITS America supports increased digital infrastructure investments, including broadband, 5G, and intelligent transportation systems, to support human drivers and AVs. ITS America prioritizes state of good repair investments for transportation infrastructure to support a mixed fleet of AVs and human-driven vehicles. ITS America does not believe AV-specific infrastructure programs are needed as long as AVs are being designed to operate under current nationwide infrastructure standards, not just areas with specific AV infrastructure improvements. ITS America supports including infrastructure improvements in the Manual on Uniform Traffic Control Devices (MUTCD) update as a more prescriptive standard for infrastructure investments that benefit AVs and human-driven vehicles. As the MUTCD evolves to become more multimodal, with a more balanced focus on vehicles and active transportation modes (e.g., walking and biking), ITS investments, including V2X applications, that support improvements in transportation services will be more fully realized.

¹It is noted that for item nine, under Advancing Electrification Goals, the Texas Department of Transportation (TxDOT) and Arizona Department of Transportation (AZDOT) are not positioned to support language regarding tax credits or incentives for consumers, as these are not issues over which they have jurisdiction or oversight. Therefore, TxDOT and AZDOT should be considered to have abstained from item nine as included in ITS America's "Automated Vehicle Standing Advisory Committee Equity, Climate, Safety, and Infrastructure Principles for Automated and Autonomous Mobility."

**Letter of February 2, 2022, from Tara Lanigan, Head of Policy, May
Mobility Inc., Submitted for the Record by Hon. Eleanor Holmes Norton**

FEBRUARY 2, 2022.

U.S. House of Representatives,
Committee on Transportation and Infrastructure,
Subcommittee on Highways and Transit, Hearing on “The Road Ahead for Auto-
mated Vehicles”

CHAIR NORTON AND RANKING MEMBER DAVIS,

Thank you for the opportunity to provide a statement on the future of autonomous vehicles (AVs). May Mobility was pleased to see a well-rounded panel and list of witnesses on this important subject.

ABOUT MAY MOBILITY

May Mobility is a Michigan-based company that develops autonomous technology for use in shared vehicles. May Mobility does not focus on the technology stack alone: we provide shared mobility solutions that can complement existing public transit. Partnering with cities, transit agencies, businesses, and states, May Mobility has deployed nine autonomous vehicle pilots to-date, eight of which have been open to the general public, and four of which are currently active in Michigan, Texas, and Indiana. Our AVs have safely provided over 300,000 rides and traveled over 400,000 miles on public roads.

OPPORTUNITIES FOR AVS

As with any new technology, automated driving systems are merely a tool for achieving tangible outcomes, and it is up to all of us to ensure that this tool is used to make our communities safer, cleaner, more accessible, and more equitable. While the potential of AV technology is enormous, not every use case is a good fit for an equitable and sustainable future of autonomous transportation. It is essential that we get it right. This is particularly true when it comes to safety, equity, the environment, accessibility, the workforce, and a collaborative approach. As several witnesses testified in the hearing, the future of AVs and our communities is not pre-ordained. The policies, planning, pilots, and partnerships that are initiated over the coming years are critical to maximizing the benefits and minimizing the negative externalities imposed by this promising technology.

Safety: May Mobility’s mission is to make transportation safer, greener, and more accessible. Safety is the foundation of a successful autonomous future, both in development and implementation of AVs. It is essential that the AV industry work hand in hand with cities and transit agencies to ensure the appropriate public safety entities are part of this conversation. This provides critical data on deployments and understandings for regulators to ensure we can appropriately monitor and develop standards for safety guidelines.

Complement existing transit: Public transportation is the backbone of our nation’s transportation system, and is the most important foundation for a truly equitable and sustainable mobility system. In many of the nation’s largest and oldest cities such as New York, Washington, DC, Boston, Philadelphia, Chicago, and San Francisco, transit delivers on this central role for large shares of trip mode shares. However, for too many medium and small-sized cities that are less densely planned, large gaps of service and frequency leave potential riders with few choices outside of owning and driving a personal vehicle. Purpose-built automated transit shuttles have the potential to bring reliable service to areas that higher capacity, lower frequency services are not able to provide.

Equity: With the right supportive policy choices, integration of AVs into public transit services can contribute to a more equitable future of transportation. As then-Mayor Pete Buttigieg described in his last State of the City Address, the “trap of being a low-income worker who lacks reliable transportation to work” is one that continues to ensnare far too many Americans¹. Just as the City of South Bend looked to innovative new approaches to tackle their persistent mobility challenges, so too should all cities and transit agencies have the flexibility and federal support to pilot new ideas with clear outcomes at the center of the planning from the start. Whether it’s reaching underserved communities, providing transportation to jobs, or creating more accessible microtransit solutions, automated transit vehicles are a new tool for transit agencies to utilize in further meeting the needs of their communities. However, if actual or de facto regulatory and policy barriers are applied to

¹ <https://southbendin.gov/mayor-pete-buttigieg-remarks-for-the-2019-state-of-the-city-address/>

transit deployments of AVs, this potential will be blocked and equitable service will be at the mercy of private services or unattainable personally owned AVs.

Accessibility: AVs also have the potential to provide more accessible transportation at the outset of their wide adoption. May Mobility offers wheelchair accessible vehicles in all of our pilot cities today, and we look forward to releasing a new ADA compliant vehicle platform later this year. We are also a semi-finalist team member of the USDOT Inclusive Design Challenge, in which we're working with the University of Michigan Transportation Research Institute to prototype their automated wheelchair securement system and create a roadmap for scale. With accessible solutions incorporated early, AVs could provide more options for the disability community to get around more safely, comfortably, and efficiently.

Workforce development: We thank the TWU for publishing its "New Technologies in Transit Systems" report. This is an important step in the conversation. The report notes, "how significant these impacts are—and whether they are positive or negative—will depend on choices made by transportation decision-makers and what policies are in place to protect and assist workers through the transition." As the industry matures, May Mobility is thinking about these long-term perspectives when it comes to workforce development, training, and integration. In the long term, transit agencies will be the owners and operators of automated vehicles, as much as they are with traditional public transit buses and other rolling stock. While we do not need to retrain the entire workforce today for a technology in the pilot stages, we support and are actively engaged in understanding and defining what the future of this integration looks like, hand-in-hand with transit agencies and their workforces.²

Regulatory Barriers to Shared AV Transit: Achieving the greatest benefits, while reducing and avoiding the most potential negative impacts, of AVs is made more difficult by a series of overlapping regulatory, policy, and other impediments that appear to push the industry toward the most harmful deployment models. In 2015, this Committee and the Congress passed the FAST Act, in which Section 24404 of amended Section 30112(b) of title 49, United States Code, to restrict the use of non-compliant vehicles for research, testing, and evaluation to automakers that have sold compliant vehicles in the past. This provision creates a moat for legacy manufacturers against competition from technology companies like May Mobility and others for any unique, purpose-built vehicle designs.

Furthermore, the process for seeking an exemption from the FMVSS for even low volume, pilot deployment use cases has proven to be an unworkable path. Companies that seek to deploy innovative vehicle designs for automated passenger vehicles have not been granted a waiver, while others have received a waiver after 18 months for cargo-only design. This has allowed foreign companies in the industry to have an advantage over domestic companies because they have been able to utilize the Part 591 importation process that allowed the deployment of non-compliant shuttles in the US for testing and evaluation. Several US companies were then forced to take their domestically built and manufactured vehicles, drive them across the Ambassador Bridge to Canada, then apply for an importation approval from NHTSA and the EPA, and then drive the vehicles back into the country. This process is not only illogical and counter to US policy priorities, it is extremely costly and time consuming. These delays and added costs have already forced several once-promising companies out of business.

While May Mobility does not manufacture vehicles, these limitations have limited the variety of options available to us when selecting a vehicle platform to either our initial low-speed vehicle platform, the Polaris GEM, or to use traditional automobiles like the Lexus RLX Hybrid that we have currently deployed. Without the ability to travel at normal roadway speeds and to offer purpose-built vehicle designs for shared AV usage, we are not able to fully maximize the best case deployment model of shared, autonomous, accessible, and electric vehicles.

For this vision to become a reality, we urge the Committee and the Department of Transportation to provide pathways for innovation to be piloted and safely tested that does not dramatically and unnecessarily delay such processes with contradictory policies and requirements.

RECOMMENDATIONS

Take a collaborative, scalable approach: Publicly available, shared and electric AV shuttles are critical to ensuring that we maximize the tremendous potential benefits of autonomous vehicles. Deploying AVs in collaboration with cities and states also

²Transport Workers Union of America, "New Technologies in Transit Systems": 2019. <https://www.twu.org/wp-content/uploads/2021/04/INNOVATION-WHITE-PAPERV2.pdf>

provides the public with a safe first experience with a new technology. But funding pilots for just one or two years will not allow for the learnings nor the scalability that both the private and public sectors need for AVs to be a successful addition to the transportation landscape.

Grant funding for pilot deployments are more essential now than ever: We were pleased to see the SMART program included in the Bipartisan Infrastructure Law, which provides robust and consistent funding opportunities for these pilots in cities of all sizes and environments. To meet the evolving transportation needs of cities, transit agencies must be enabled to innovate, iterate, and adapt the way that they serve their communities. Without federal grant programs, transit agencies will have no funding to try new approaches or technologies without taking money from core services and functions funded through traditional formula funds and local sources. FTA grants also ensure the equally important involvement of FTA for distributing lessons learned and best practices so that the entire industry is aware of ideas and lessons emanating across the nation.

Facilitate a productive, holistic conversation on workforce development: There is an opportunity for transit agencies and AV providers to figure out a long-term workforce plan together. This does not mean purely automating every vehicle in public transit; this means figuring out how a new technology and the possibilities for vehicle design and deployment models offer great new tools for transit agencies and mobility managers to provide a better, more equitable, more sustainable, and ultimately more utilized public transit system.

We know that labor, industry, transit agencies, and the DOT must begin working together to assess and plan for the just and inclusive workforce transition. We stand eager and ready to be active in that discussion. Today's hearing was an important step in advancing these conversations, but it is even more important that this Committee and the Department further the conversation among all stakeholders beyond the questions this technology may raise, and toward working together to solve them.

CONCLUSION

Thank you for holding this important hearing and for your leadership on these issues. We look forward to being an active and engaged participant in future conversations and legislative efforts to ensure the best outcomes from introducing new and exciting technologies that best meet the mobility needs of the public.

Sincerely,

TARA LANIGAN,
Head of Policy, May Mobility Inc.

Letter of February 16, 2022, from Ben Siegrist, Director, Infrastructure, Innovation, and Human Resources Policy, National Association of Manufacturers, Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 16, 2022.

The Hon. ELEANOR HOLMES NORTON,
Chairwoman,
Highways and Transit Subcommittee, Transportation and Infrastructure Committee,
U.S. House of Representatives, Washington, DC 20515.

The Hon. RODNEY DAVIS,
Ranking Member,
Highways and Transit Subcommittee, Transportation and Infrastructure Committee,
U.S. House of Representatives, Washington, DC 20515.

DEAR CHAIRWOMAN NORTON AND RANKING MEMBER DAVIS,

The National Association of Manufacturers (NAM), the largest manufacturing association in the United States representing manufacturers in every industrial sector and in all 50 states, appreciates your focus on addressing autonomous vehicle (AV) regulations and potential legislation by holding the recent hearing entitled, "The Road Ahead for Automated Vehicles."

The NAM shares the committee's interest in the safe deployment of AVs across the United States and believes that there is ample opportunity to advance important legislation to safely support the deployment of new vehicle technologies. The expansion of AVs into our national transportation system is an opportunity to lead by enhancing safety on our roadways and increasing efficient goods movement across our strained supply chains. By holding the recent hearing focused on AV regulation, safety, workforce and societal impacts, the committee is reaffirming its com-

mitment to a comprehensive review of outstanding regulatory concerns and federal oversight. Manufacturers look forward to supporting the legislative process to get safer vehicles, utilizing innovative technology, on the roads for the benefit of all.

Legislation that would provide a necessary national regulatory framework has repeatedly stalled in Congress and this inaction has slowed our global leadership in the AV marketplace. America's AV innovators require a regulatory regime that allows the continued pursuit of safe, data-driven development of vehicle technology. Under current regulations, the National Highway Traffic Safety Administration (NHTSA) can issue no more than 2,500 exemptions per year, per manufacturer, for AVs that do not utilize existing approved safety equipment to operate on America's roadways. By their very nature, the most advanced AVs do not or will not require the same equipment standards as even the most modern, non-automated vehicles. By restricting NHTSA exemptions, the current regulatory paradigm prohibits the collection and synthesis of data that is vital for AVs to further develop safety enhancements. As your committee considers legislation, the NAM encourages you to expand NHTSA's ability to grant AV exemptions in order to further develop safety technology.

Additionally, NHTSA is currently pursuing a variety of rulemakings related to AV deployment and safety oversight. Along with industry stakeholders, the NAM wrote to Secretary Buttigieg last year urging for the timely publication and processing of those ongoing regulations. The uncertainty surrounding potential regulatory action presents an impediment to innovation at a crucial juncture in AV development. The NAM and related equipment manufacturers and suppliers share the goal of safe and responsible AV deployment and we encourage the committee to work closely with agency regulators to clear any rulemaking backlog.

Lastly, as with all safety-related vehicle regulation, NHTSA plays a vital role in establishing a federal standard that will allow for safe vehicle operations across all jurisdictions. While states should rightfully be partners committed to enacting vehicle rules for safe, local road use, the U.S. Department of Transportation must pursue the comprehensive and preeminent regulatory framework necessary for national AV deployment. A nationwide standard that supersedes any efforts for patchwork regulatory compliance will ensure the highest performing technological advances are commercially viable and available for all consumers.

The development and deployment of AVs into the larger fleet of vehicles on American roads will require a partnership between automotive innovators, manufacturers and regulators to meet technological and safety challenges. Manufacturers are on the cutting edge of vehicle development, but also related road markings, signage, equipment, and systematic components that are needed to grow the domestic AV industry into a global economic engine. We encourage your committee to consider expanding NHTSA's exemption capabilities, pursue timely regulatory development and ensure the establishment of a national regulatory framework necessary for safe AV deployment.

Sincerely,

BEN SIEGRIST,
Director, Infrastructure, Innovation, and Human Resources Policy,
National Association of Manufacturers.

**Statement of the National Safety Council, Submitted for the Record by
Hon. Eleanor Holmes Norton**

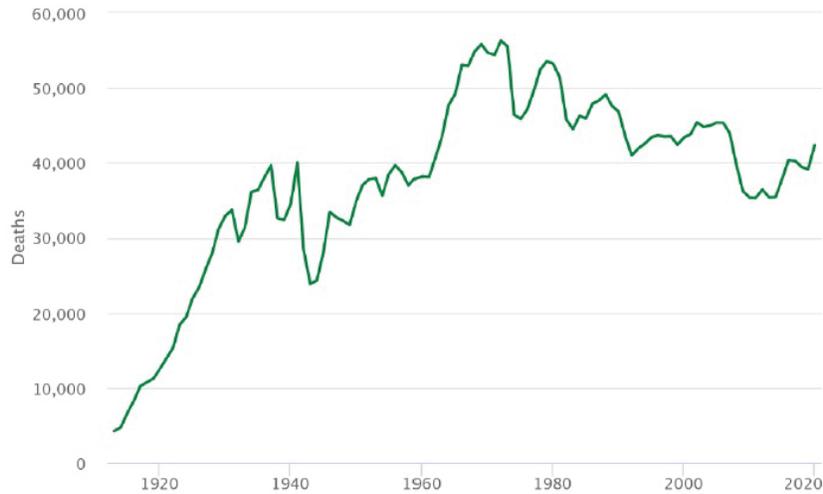
Thank you for allowing the National Safety Council (NSC) to submit this statement for the record. NSC is a nonprofit organization with the mission of eliminating preventable deaths from the workplace to any place through leadership, research, education and advocacy. Our 15,500 member companies represent employees at nearly 50,000 U.S. worksites.

The National Highway Traffic Safety Administration (NHTSA) projects that an estimated 31,720 people were killed in motor vehicle crashes in the first nine months of 2021 between January and September.¹ These entirely preventable crashes have a tremendous human toll and cost the American economy over \$463 billion a year.²

¹ <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813240>

² <https://injuryfacts.nsc.org/motor-vehicle/overview/introduction/>

Motor vehicle deaths, United States, 1913–2020



NSC would like to add information to the hearing record on the following topics:

1. Automated vehicle (AV) technologies have the potential to save thousands of lives each year but will require federal leadership to set minimum national safety standards and requirements.
2. Consumers are confused about the advanced driver assistance system (ADAS) safety features vehicles currently have. As such, consumer education about these safety features should be enhanced and manufacturers should be required to clearly communicate the limits of existing safety technologies.
3. Connected vehicles are an important part of safe implementation of AVs, and federal Communications Commission (FCC) action could undermine full implementation of connected vehicles.
4. There will be a range of technologies on the roads for decades, representing everything from existing non-automated vehicles to the as yet unseen full autonomous, which will bring yet unknown additional safety issues to the fore.

Understanding that the Committee's jurisdiction is commercial vehicles, NSC uses the term vehicle to refer to both personal and commercial throughout the statement.

FEDERAL LEADERSHIP NEEDED TO ADVANCE THE LIFESAVING POTENTIAL OF ADVANCED TECHNOLOGY

NSC believes advanced vehicle technology, up to and including fully automated vehicles, can provide many benefits to society if deployed responsibly and with safety as a primary goal. Most importantly, advanced vehicle technology has the potential to greatly reduce the number of fatal crashes on our roadways. However, federal leadership and action on motor vehicle safety is required to realize these benefits and ensure one level of safety across the United States regardless of the technology enjoyed by consumers. Consumers need confidence in the safety of their vehicles regardless of where they reside, and manufacturers need certainty in order to invest in design and production. States do not possess the expertise or resources to replicate design, testing and reporting programs. Further, a patchwork of requirements will result in confusion for consumers and an increase in cost for manufacturers and operators. Finally, the absence of safe, workable standards will drive development, testing and deployment overseas, resulting in the flight of innovation and the jobs that accompany it to locations outside of the U.S. The absence of these standards also contribute to avoidable safety risks and could contribute to the already high number of preventable deaths on our roadways.

TRANSPARENCY

As Congress evaluates potential legislation on AVs and other automated safety advances, transparency regarding this technology is key. Previous bills have included requirements for reporting to DOT by AV developers on safety metrics. NSC supports such required reporting. Congress should add this level of transparency and require topics including, but not limited to, crashworthiness, human-machine interface data, post-crash behavior, capabilities and limitations of the vehicle, operational design domain, and consumer education efforts to be reported. This information should be reported regularly and presented clearly in a way for the public to be able to digest.

Data are key to transparency and safety. NSC believes that data on electronic logging devices (ELDs) and electronic data recorders (EDRs), which provide a window into the human-machine interface with advanced vehicles, can be key to improve safety. The knowledge gained from these devices allows manufacturers to be nimbler and make adjustments in near real time to improve safety based on what is actually occurring in operation, rather than making changes based on assumptions and estimations that must be accommodated in a later model year. To this end, Congress should facilitate data sharing as widely as possible and require that manufacturers provide accessible, standardized data to law enforcement, state highway safety officers, investigators, insurers, and/or other relevant stakeholders. Collecting and sharing de-identified data about near misses and other relevant problems could also help to aggregate useful information for the motor vehicle industry. It will allow the industry to take proactive steps based on leading indicators, rather than waiting for a crash or a series of crashes to occur. Finally, the data will be useful to researchers and the safety community in analyzing the safety benefits—and potential drawbacks—of these technologies as they continue to mature.

Acquiring an understanding of what happens when systems perform as intended, fail as expected, or fail in unexpected ways yields valuable information for manufacturers—some of whom have common suppliers. Further, in-service data, near miss and post-crash information sharing can help civil engineers and planners design better and safer roadways. It will also help safety and health professionals design better interventions to discourage risky driving or affect the behaviors of other roadway users.

NSC has long supported de-identified data sharing similar to what the aviation industry does, and we are pleased to see the PARTS (Partnership for Analytics Research in Traffic Safety) proceeding. Analysis of de-identified data in the vehicle industry will provide windows into leading indicators, increasing the potential to save lives.

ENHANCING CONSUMER UNDERSTANDING OF ADVANCED DRIVER ASSISTANCE SYSTEMS

The potential safety benefits of automated vehicles and other advanced safety technologies could be incredible. However, to be clear, it will be decades before there is meaningful AV fleet penetration on U.S. roadways. In the meantime, there are significant safety technologies currently available in vehicles today that should be made more widely available. Advanced Driver Assistance Systems (ADAS) can prevent or mitigate crashes, and NSC is working to expand consumer education around these new technologies, which is critical in realizing their full potential. NSC created the first and largest ADAS national education campaign, MyCarDoesWhat.org. The purpose of MyCarDoesWhat.org is to educate the public about these assistive safety features in order to maximize their potential lifesaving benefits. Visitors to MyCarDoesWhat.org learn about dozens of existing safety features on their vehicles, including lane departure warning, blind spot monitoring, backup cameras, and automatic emergency braking.

In 2019, NSC, in collaboration with AAA, Consumer Reports, and J.D. Power, released “Clearing the Confusion: Recommended Common Naming for Advanced Driver Assistance Technologies.”³ Since release, more organizations have joined in support of standard, simple, and specific names for ADAS technologies in an effort to reduce consumer confusion. Safety features may change over time as software and hardware updates in turn modify the operational parameters for vehicle systems. Providing education throughout the life of vehicles can help consumers better understand how these features can advance safety. Today, 93 percent of new vehicles offer at least one ADAS feature, and the terminology often seems to prioritize marketing over clarity.⁴ DOT endorsed the naming recommendations, and we urge other safety

³ <https://www.sae.org/binaries/content/assets/cm/content/miscellaneous/adas-nomenclature.pdf>

⁴ <https://www.aaa.com/AAA/common/AAR/files/ADAS-Technology-Names-Research-Report.pdf>

organizations, automakers, journalists and lawmakers to join us in adopting these terms.⁵

NSC recommends that, at the very least, systems that are not fully automated (level five), should not be described as such. ADAS, with emphasis on “driver assist,” are the only technologies commercially available in vehicles today and each and every one of those vehicles requires the driver to remain fully engaged in the driving task. That fact is often lost in marketing, media reports and consumer expectations. Labeling a motor vehicle as “automated” or “autonomous” today, or even using terms such as “autopilot” or “self-driving,” only confuses consumers and can contribute to loss of situational awareness around the driving task. Marketing is not education. It will take a commitment to standard nomenclature and clear performance outcomes promulgated by DOT to ensure that consumers better understand how to engage with and what to expect from these technologies.

5.9 GHz

Connected vehicles are an important part of safely implementing AVs to provide safety redundancy. FCC actions to reallocate the 5.9GHz “safety band” away from its intended use for transportation safety to unlicensed use, such as Wi-Fi derail this effort to save lives. NSC strongly believes that FCC action to diminish the safety band to be a grave mistake. The federal government, numerous automakers and suppliers have proven this band is viable for vehicle communications, and some are beginning to deploy to this dedicated spectrum.

Improvements in technology and safety in transportation have historically gone hand-in-hand. Setting aside this spectrum for transportation safety was done with the goal of reducing or mitigating fatal transportation incidents, some of which were at least partially attributable to predictable and preventable human behavior. The FCC action nullifies this foresight and removes the full benefit that technology provides.

Motor vehicle crashes are an epidemic in the U.S., and operating a motor vehicle remains one of the deadliest things we do on a daily basis in spite of much improved, safer vehicle designs and record-setting seat belt use rates across the nation. The FCC should be part of the solution to saving lives. NSC urges the Subcommittee to seek answers from the FCC about the safety impacts of this proposal and ensure that roadway safety remains our top priority.

CONCLUSION

Today, we have millions of drivers behind the wheel and spend millions of dollars on education and enforcement campaigns. Yet, we still recognize billions in economic losses as a result of motor vehicle crashes. The integration of automated vehicle technologies will likely be messy as we deal with a complex and ever-changing human-machine interface. That is why federal leadership is needed. There is no need to repeat mistakes of the past.

NSC appreciates this Committee’s leadership on vehicle technology and safe roadway transportation. If safety for the traveling public is the ultimate goal, advanced technology provides a promising opportunity to achieve that outcome and will go a long way to take us down the road to zero.

⁵ <https://www.transportation.gov/briefing-room/us-transportation-secretary-elaine-l-chao-announces-new-initiatives-improve-safety>

Letter of February 1, 2022, and Autonomous Vehicles Policy Guide, from Rick Guerra, P.E., F.NSPE, President, National Society of Professional Engineers, Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 1, 2022.

The Honorable ELEANOR HOLMES NORTON, Chairwoman,
The Honorable RODNEY DAVIS, Ranking Member,
Subcommittee on Highways and Transit,
Committee on Transportation and Infrastructure, U.S. House of Representatives,
2165 Rayburn House Office Building, Washington, DC 20515.

NSPE Public Comment RE: House Highways and Transit Subcommittee Hearing:
The Road Ahead for Autonomous Vehicles

On behalf of more than 23,000 members of the National Society of Professional Engineers, these comments are submitted for consideration of inclusion into the public record for the House Highway and Transit's February 2 hearing on "The Road Ahead for Autonomous Vehicles." NSPE's commitment to the protection of the public health, safety, and welfare warrants a seat at the table in the discussion around autonomous vehicles (AVs).

The National Society of Professional Engineers is committed to creating a world where the public can be confident that engineering decisions affecting their lives are made by qualified and ethically accountable individuals. NSPE Position Statement No. 03-1772 states that the testing and deployment of AVs must include a licensed professional engineer. The rationale for the position is rooted in a professional engineer's ethical obligation to protect the public health, safety, and welfare.

The duty to protect the public goes beyond an ethical obligation, however; every state licensing board has a system of laws and regulations that holds professional engineers accountable for protecting the public. Professional engineers also must complete continuing education (the number of hours varies by state) to maintain their license. By fulfilling a continuing education requirement, professional engineers are able to stay abreast of new developments in AV technology and can use that knowledge to inform decisions around the development and deployment of AVs. By virtue of their ethical duty to protect the public and technical expertise, professional engineers are uniquely positioned to contribute to this conversation.

With this role in mind, the National Society of Professional Engineers recommends the Subcommittee utilize the voice of professional engineers when considering policy around AVs, as well as follow the recommendation found in NSPE's Autonomous Vehicles Policy Guide.

NSPE would like to highlight its recommendation on creating a third-party verification system found in the Autonomous Vehicle Policy Guide. A third-party verification process should establish that the automated vehicle technology under review meets a minimal level of safety, as determined by an assessment of risk. This can be done through the submittal of risk assessments audited by a professional engineer who is in responsible charge of the third-party verification process. When using the expertise of a PE as a third party, one can be sure that their decisions are being made with the utmost consideration for the public health, safety, and welfare rather than out of loyalty to the manufacturer or owner of the Automated Driving System (ADS). By suggesting this guide rail of third-party verification, we ensure responsible innovation in ADS technology.

I thank the Subcommittee Chair and Ranking Member for scheduling a hearing on this important topic, and for their consideration of these comments.

Sincerely,

RICK GUERRA, P.E., F.NSPE,
President, National Society of Professional Engineers.

Attachment: *Autonomous Vehicles: A Regulatory Policy Guide*



AUTONOMOUS VEHICLES: A PUBLIC REGULATORY POLICY GUIDE

With the introduction of autonomous vehicles, automation is poised to become a much larger part of our transportation environment. Much of the discussion to date has focused on the technology, its capabilities, and the perceived public benefits. However, many questions remain unanswered by industry, which has led to uncertainty within the public regulatory environment. To address this uncertainty, NSPE proposes the outcome-based standards below, based on careful consideration and deliberation, as a starting point for adopting standards that protect public safety.

This policy guide provides public policy decision makers, regulators, manufacturers, and others with guidelines to measure safety readiness of autonomous vehicles under consideration for deployment.

1. Risk Assessment

Autonomous vehicle manufacturers should adopt a risk assessment and/or hazard severity model. *What is an acceptable amount of risk?* In order for industry and the public to properly assess risk, manufacturers should be required to report *all* incidents involving autonomous vehicles. An industry standard for risk assessment needs to be established.

2. Ethics Compliance Disclosure

Autonomous vehicle manufacturers' *safety concerns* cannot, nor should, be limited solely to the vehicle's occupants. A human driver will assess the immediate environs to determine the best possible outcome for an operating action.

3. Self-Sufficiency

Autonomous vehicles should be able to *operate safely and correctly* without the support of additional public infrastructure and investment, such as dedicated AV lanes and vehicle-to-infrastructure investments.

4. Accountability

Autonomous vehicles manufacturers should be *required* to maintain an expanded "black box" (event data recorder) of data inputs for post-incident evaluation and should include the following:

- Reference to a time standard so all recorded events refer to a known point in time.
- The service brake data event should also include braking intensity from 0 to 100%, not just ON/OFF.
- A series of recordings from the outside object detection sensors, both forward and lateral looking—invaluable information for accident reconstruction.
- Outside conditions (temperature, weather conditions, posted speed limits, and traffic intensity) should also be recorded.
- Any received driving condition alerts that may have been broadcast via the GPS or traffic control signals.

5. Third-Party Verification

Autonomous vehicle manufacturers should be required to demonstrate capability for safe driving before further expansion and rollout. Third-party verification should be performed by a *licensed professional engineer* or others who are appropriately qualified.

6. Redundancy

Autonomous vehicle manufacturers should provide *back-up operating systems*. Redundancy can ensure that critical operating systems will function while maintaining passenger and occupant safety.

7. Map Standardization

Autonomous vehicle manufacturers should work toward a *standardized mapping system* that ensures the correct location of the vehicle and that provides necessary and timely changes to the system's maps.

8. Security

Autonomous vehicle manufacturers should demonstrate, before widespread deployment, a certain level of security to *prevent jamming and hacking*.

9. *Training/Operational Licensing*

Autonomous vehicle manufacturers should *provide training* and operational support beyond the regular driver's license, educating drivers about the limitations of self-guiding features.

10. *Maintain Manual Controls*

Manual driver controls should be maintained for autonomous vehicles for all levels of autonomy. Eliminating the ability of vehicle occupants to move the vehicle to a position of safety is counterintuitive to safety principles.

11. *Safety Features*

The current level of automotive safety devices/features should be maintained. *Vehicle safety devices* and features should remain until sufficient historical data is compiled on the accident history and safety record of autonomous vehicles and can justify otherwise.

12. *Vehicle-to-Vehicle Connectivity*

As part of autonomous vehicle operation and to enhance safety, *vehicle-to-vehicle connectivity* should be included as part of autonomous vehicle operation.

Licensed professional engineers should play a critical role as part of the autonomous vehicle design and manufacturing process because of the breadth and depth of the professional engineers' understanding of engineering issues as well as their obligation to hold paramount the public health, safety, and welfare.

Letter of February 1, 2022, from Todd Spencer, President and CEO, Owner-Operator Independent Drivers Association, Inc., Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 1, 2022.

The Honorable ELEANOR HOLMES NORTON,
Chairman,
Subcommittee on Highways and Transit, 2165 Rayburn House Office Building,
Washington, DC 20515.

The Honorable RODNEY DAVIS,
Ranking Member,
Subcommittee on Highways and Transit, 2165 Rayburn House Office Building,
Washington, DC 20515.

Re: Subcommittee on Highways and Transit hearing, "The Road Ahead for Automated Vehicles"

CHAIRMAN HOLMES NORTON AND RANKING MEMBER DAVIS,

Since 1973, the Owner-Operator Independent Drivers Association (OOIDA) has been advancing and protecting the rights of small-business motor carriers and professional drivers. OOIDA is a critical stakeholder for all issues affecting trucking, with a unique focus on those directly impacting small-business truckers. As the Subcommittee on Highways and Transit meets to discuss the future of automated vehicles (AVs), we urge you to consider how these technologies will impact the trucking industry, especially the vital role of professional drivers and independent owner-operators.

Professional truckers have a keen interest in the development of AVs as these technologies have the potential to drastically change the trucking industry, in particular its workforce. While we are still years away from fully automated trucks, decisions made today will have a significant impact on how AV technologies are deployed, and ultimately, on the livelihood of truck drivers and the economy at large. Elected officials, federal regulators, and our industry partners must ensure AV policies are developed in a safe and responsible manner that takes commercial drivers' perspective into account.

We understand the desire to swiftly unleash American ingenuity in multiple transportation sectors and agree the federal government must play an integral role in balancing safety and innovation on our roads. But Congress should not pursue a one-size-fits-all legislative approach that implements the same policies for autonomous passenger and commercial vehicles. The safe operation of an automobile contrasts greatly with that of a heavy vehicle. The introduction of autonomous technology to both classes will present distinct safety challenges that should be addressed and regulated on separate paths. Naturally, the equipment and technology that works well on an automobile weighing 3,000–4,000 pounds is far different from

what is needed for trucks weighing 80,000 pounds. As various Committees consider AV legislation, Congress must develop separate policies that better reflect the different safety challenges facing automobiles and heavy vehicles.

OOIDA members and millions more working in other segments of trucking face a particularly uncertain future as technology may first diminish the quality of their jobs and then threaten to displace them completely. Given the economy's reliance on the trucking industry, Congress must consider the potential displacement of jobs, expected changes to the skills and training necessary for drivers to safely operate autonomous trucks, and how these changes would affect driver compensation. OOIDA also recommends that Congress examine the specific impact AVs would have on small trucking businesses, which account for 96% of all U.S. motor carriers. Lawmakers must also evaluate the costs associated with the introduction of various technologies, how these costs would affect the price of new and used trucks, and how price changes would impact the ability of a small businesses to purchase new vehicles.

OOIDA strongly believes that any process to advance automated technology should be met with mandatory data transparency from manufacturers. This will help educate consumers, the industry, and regulators about the actual reliability of autonomous technology. Despite the various claims that AVs will lead to zero deaths, there have been real-world situations in which automation has devastatingly failed. While AVs might improve safety under certain conditions, they create new risks with dangerous and often unknown outcomes. Regrettably, U.S. Department of Transportation proposals such as AV 4.0, the AV Comprehensive Plan, and the National Highway Traffic Safety Administration's (NHTSA) AV TEST Initiative have maintained a self-certification approach and promoted voluntary reporting as the way to balance and promote safety and innovation.

We supported NHTSA's 2021 General Standing Order that now requires AV trucking companies to report crashes on public roadways. However, this safety data should be made available throughout the deployment process, not just after a crash occurs. The use of unproven automated technologies on our highways poses a significant threat to small-business truckers, and we urge you to take action to protect all road users with greater transparency and oversight of their development. Without such measures, we will never know how or why AV technology is causing crashes and fatalities. In fact, some developers have already used the legal system in hopes of keeping safety data from public view.

The potential introduction of AVs on the nation's highways invites more questions than answers. As autonomous technology develops, OOIDA is concerned that federal regulators will push for more technology as the solution to the industry's safety and workforce issues without considering the negative impacts of these technologies. Regardless of their potential, it is important to understand exactly how well these AVs perform. Beyond ensuring that legislation provide appropriate standards for the safe operation of AVs, Congress must consider practices and unintended consequences that might offset the potential safety, mobility, and sustainability benefits from the technology.

Thank you,

TODD SPENCER,

President and CEO, Owner-Operator Independent Drivers Association, Inc.

cc: Members of the U.S. House Committee on Transportation and Infrastructure

Letter of February 1, 2022, from Jordan Crenshaw, Vice President, Chamber Technology Engagement Center, U.S. Chamber of Commerce, Submitted for the Record by Hon. Eleanor Holmes Norton

FEBRUARY 1, 2022.

The Honorable ELEANOR HOLMES NORTON,

Chair,

Committee on Transportation and Infrastructure, Subcommittee on Highways and Transit, United States House of Representatives, Washington, DC 20510.

The Honorable RODNEY DAVIS,

Ranking Member,

Committee on Transportation and Infrastructure, Subcommittee on Highways and Transit, United States House of Representatives, Washington, DC 20510.

DEAR CHAIR HOLMES NORTON AND RANKING MEMBER DAVIS:

The U.S. Chamber of Commerce's Technology Engagement Center (C_TEC) respectfully submits the following statement for the record for the House Transpor-

tation and Infrastructure's Subcommittee on Highways and Transit hearing titled "The Road Ahead for Automated Vehicles."

America's future economic success, growth, and competitiveness depends on a thriving and innovative private sector. Every company is a tech company, and data-driven innovation is the foundation of businesses across the country. The transportation sector is no different, and the private sector is leading the way on advancing new technologies to increase motor vehicle safety and security, enhance Americans' mobility options, and bolster American leadership abroad.

In particular, automated vehicles (AVs) are a significant and transformative transportation technology, impacting industry sectors ranging from insurance to trucking while providing enormous benefits to consumers and the public at large. We advocate for Congressional action to advance a national framework for legislation and caution policymakers against advancing policies that would hinder U.S. leadership and the benefits of AVs.

The introduction of AVs will bring several important benefits. First, the most critical benefit is the potential for the technology to reduce traffic fatalities. According to the National Highway Traffic Safety Administration (NHTSA), 38,680 Americans lost their lives in 2020 due to motor vehicle crashes, a significant portion of which can be attributed to human error.¹ Second, AVs will empower more Americans to be mobile. Currently, more than six million Americans have a disability impairing their ability to obtain the transportation they need to get to work, shop, and travel.² AVs are expected to empower two million Americans with disabilities to become employed as well as save \$9 billion in healthcare costs from reducing missed medical appointments stemming from transportation challenges.³ Finally, the economic potential of automated vehicles is substantial. It is estimated that the annual U.S. customer and public benefits from full AV deployment will reach \$796 billion by 2050.⁴

While the United States currently remains the leader in developing AV technology, American leadership is not guaranteed and faces challenges from our economic competitors. By 2025, China plans that 30% of all cars sold in China will have some level of automation and is projected to emerge as the largest market for self-driving vehicles at \$500 billion by 2030.⁵ Also, Europe is not far behind. According to KPMG's 2020 Autonomous Vehicles Readiness Index, six of the top ten ranked countries are in Europe.⁶

To ensure continued U.S. global leadership in AV technology, C TEC encourages Congress to enact legislation to facilitate safe AV development and deployment. In the 115th Congress, the House of Representatives unanimously passed H.R. 3388, the SELF DRIVE Act, which would establish a safe and effective regulatory framework for AVs.⁷ In October 2020, C TEC published a comprehensive policy agenda for emerging transportation technologies, including AVs, which could serve as a basis for Congressional and Executive action.⁸

While C TEC believes that these policy solutions will create a regulatory environment to further enable widespread AV deployment, Congress should avoid pursuing policy proposals that would inadvertently hinder innovation and impede the benefits provided by AVs. Lawmakers should be especially cautious of policies that impose unnecessary regulatory burdens or expand legal liability.

¹Alexa Lardieri, *Traffic Deaths Increased in 2020 Despite Fewer People on Roads During Pandemic*, U.S. NEWS AND WORLD REP. (Jun. 4, 2021), <https://www.usnews.com/news/health-news/articles/2021-06-04/traffic-deaths-increased-in-2020-despite-fewer-people-on-roads-during-pandemic>.

²Henry Claypool et al., *Self-Driving Cars: The Impact on People with Disabilities*, RUDERMAN FAM. FOUND. & SECURING AM.'S FUTURE ENERGY (Jan. 2017), https://rudermanfoundation.org/wp-content/uploads/2017/08/Self-Driving-Cars-TheImpact-on-People-with-Disabilities_FINAL.pdf.

³Id.

⁴Richard Mudge et al., *America's Workforce and the Self-Driving Future*, SECURING AM.'S FUTURE ENERGY (Jun. 2018), https://avworkforce.secureenergy.org/wp-content/uploads/2018/06/Americas-Workforce-and-the-Self-Driving-Future_Realizing-Productivity-Gains-and-Spurring-Economic-Growth.pdf.

⁵Chris O'Brian, *China's Drive To Dominate Autonomous Cars*, MEDIUM: THE INNOVATOR (Oct. 22, 2019), <https://innovator.news/chinas-drive-to-dominate-autonomous-cars-84894b95961f>.

⁶KPMG International, *2020 Autonomous Vehicles Readiness Index* (Jul. 2020), <https://assets.kpmg/content/dam/kpmg/uk/pdf/2020/07/2020-autonomous-vehicles-readiness-index.pdf>.

⁷Aarian Marshall, *Congress Unites (Gasp) to Spread Self-Driving Cars Across America*, WIRED (Sept. 6, 2017), <https://www.wired.com/story/congress-self-driving-car-law-bill/>.

⁸U.S. Chamber's Technology Engagement Center (C TEC), *America's Next Tech Upgrade: Building the Foundation for the Future of Transportation* (Oct. 2020), https://americaninnovators.com/wp-content/uploads/2020/10/CTEC_TechUpgrade_Transportation.pdf.

The United States must not cede its competitive edge in the AV revolution, nor limit the ability for this technology to save lives and increase mobility for millions of Americans. C-TEC stands ready to work with Congress to further AV adoption.

Sincerely,

JORDAN CRENSHAW,
*Vice President, Chamber Technology Engagement Center,
 U.S. Chamber of Commerce.*

cc: All members of the Highways and Transit Subcommittee

**Statement of the American Alliance for Vehicle Owners' Rights,
 Submitted for the Record by Hon. Sam Graves of Missouri**

The undersigned organizations and companies of the American Alliance for Vehicle Owners' Rights ("AAVOR") respectfully submit this statement to the House Transportation & Infrastructure Committee and ask that it be made part of the official hearing record for the February 2, 2022 hearing entitled "The Road Ahead for Automated Vehicles."

BACKGROUND ON AAVOR

AAVOR is a diverse group of stakeholders united by the common goal of guaranteeing the right of all vehicle owners and users to have access to, and control of, the data generated by their vehicles. AAVOR's members represent interests from across the mobility ecosystem, including consumer advocates, fleet owners and operators, shared mobility service providers, automotive repairers, insurers, automotive recyclers, and telematics providers.

CONNECTION BETWEEN VEHICLE DATA ACCESS AND AUTONOMOUS VEHICLES

The policy issue of the control—or "ownership"—of, and access to, the data generated by a motor vehicle—whether a car or a truck—by the owner of that motor vehicle is not solely an autonomous vehicle (AV) issue. It applies to the motor vehicles on the road today as well as those that will be deployed in the coming decades. From AAVOR's point of view, getting a vehicle data access bill done and reaffirming the rights of vehicle owners to control vehicle generated data is a goal the members of the House Transportation and Infrastructure Committee—and the entire Congress—should embrace. Whether vehicle data access for vehicle owners and those who have the owners' permission to access that data is addressed through AV legislation or another legislative vehicle is less important than achieving the goal of enactment of such an important new law.

THE "ROAD AHEAD" FOR VEHICLE DATA ACCESS

Vehicle generated data is the new frontier for the development of the future of mobility. Today's connected vehicles (cars, trucks and buses) offer consumers innovative new services, and bring significant downstream business development potential for all stakeholders in the on-road transportation sector, including, but not limited to, navigation (real-time localization/traffic information), infotainment (access to online movies/music), maintenance (fleet management/remote diagnostics/vehicle recovery), insurance (pay-as-you-drive/claim investigation), traffic efficiency (reduced congestion), sustainability (reduced fuel consumption), and safety.

However, this requires the right legal framework, which enables all stakeholders to access data generated by vehicles, starting with individual consumers and fleet owners, and extending through Original Equipment Manufacturers (OEMs), parts suppliers, vehicle repairers, and the other many players across the entire transportation sector. This vehicle-generated data is related to nearly every aspect of the vehicle's operation and has been historically accessed through a physical "on-board diagnostics" (e.g., OBD-II in passenger cars) port. A growing number of vehicles are transitioning to wireless access, bypassing the in-cabin, wired-access port and restricting access to vehicle-generated data by vehicle owners and third parties.

Vehicle-generated data—whether accessed through a wired port or wirelessly—already provides many benefits to both consumers who own individual cars and companies that own dozens or thousands of vehicles. But these benefits will only be realized if vehicle owners: (1) retain the ability to securely access and control the data their vehicles (and equipment attached to their vehicles) generate, collect and store; (2) without artificial barriers that reduce consumer choice or competition; (3) in real-

time through secure, technology-neutral, standards-based, in-vehicle access; and, (4) without obtaining consent from an entity that does not own or lease the vehicle.

AAVOR is convinced that Congress must take a lead role in guaranteeing vehicle owners and lessees access to and control of all data generated, collected and stored by vehicles. AAVOR supports enactment of federal policies that safeguard the rights of vehicle owners to:

- securely access and control their vehicle data (including authorizing access by third parties);
- directly, through in-vehicle access, in real-time;
- through a technology-neutral, standards-based, secured interface;
- that provides interoperable and bi-directional communication with the vehicle.

The rights of vehicle owners to control and access the data generated by their vehicles is too important to be left unaddressed by federal legislation. AAVOR supports federal efforts to establish a framework for securing the continued rights of vehicle owners—and entities that secure the express permission of vehicle owners—to control and access vehicle-generated data on a real-time, secure and competitive basis.

AAVOR appreciates the opportunity to submit this statement to the Committee today and looks forward to working with its leadership and members to secure enactment of federal vehicle data access legislation in the near future. If you have questions about AAVOR's views on the issues covered in these comments or other policy matters related to vehicle data access, competition, consumer protection or privacy, please do not hesitate to contact Greg Scott.

AMERICAN BUS ASSOCIATION.
AMERICAN CAR RENTAL ASSOCIATION.
AMERICAN PROPERTY & CASUALTY
INSURANCE ASSOCIATION.
AUTOMOTIVE RECYCLERS ASSOCIATION.
AUTOMOTIVE SERVICE ASSOCIATION.
CONSUMER ACTION.
NAFA FLEET MANAGEMENT
ASSOCIATION.

NATIONAL CONSUMERS LEAGUE.
NATIONAL MOTOR FREIGHT TRAFFIC
ASSOCIATION.
OWNER-OPERATORS INDEPENDENT
DRIVERS ASSOCIATION.
GEOTAB, INC.
LYTX.
PRIVACY4CARS.
SAFELITE GROUP.

Article Entitled, “Kansas Man Struck, Killed on I-70 in Kansas City Early Saturday, Police Say,” by Kaitlyn Schwerts, fox4kc.com, August 30, 2021, Submitted for the Record by Hon. Sharice Davids of Kansas

KANSAS MAN STRUCK, KILLED ON I-70 IN KANSAS CITY EARLY SATURDAY, POLICE SAY

by Kaitlyn Schwerts

fox4kc.com, posted Aug. 28, 2021, and updated Aug. 30, 2021

<https://fox4kc.com/news/kansas-man-struck-killed-on-i-70-in-kansas-city-early-saturday-police-say/>

KANSAS CITY, Mo.—A Kansas man died early Saturday morning after he was struck by a tractor-trailer on Interstate 70 in Kansas City, police said.

The crash happened just before 3:30 a.m. in the westbound lanes of I-70 near Pittman Road. According to a crash report from Kansas City police, the victim's car, a Chrysler sedan, was stopped in the outside lane of traffic after experiencing a tire blowout.

Police said the driver of a westbound tractor-trailer tried to swerve around the Chrysler and then struck the man, who was standing nearby. The tractor-trailer then ran off the right shoulder and overturned.

The driver of the Chrysler died at the scene. He has been identified by police as a 28-year-old man from Osawatomie, Kansas. He has been identified as Mark A. Johnson.

The driver of the tractor-trailer was not reported to be injured. A passenger in the tractor-trailer was taken to a hospital with injuries that were not considered to be life-threatening.

I-70 was closed at Blue Ridge Boulevard for about two hours as police investigated early Saturday. The interstate has since been reopened.

Article Entitled, “Grim Reminder: Latest Roadside Tragedies Underscore Need for Drivers to Slow Down, Move Over,” by Ellen Edmonds, Manager, AAA Public Relations, AAA, September 29, 2021, Submitted for the Record by Hon. Sharice Davids of Kansas

GRIM REMINDER: LATEST ROADSIDE TRAGEDIES UNDERSCORE NEED FOR DRIVERS TO SLOW DOWN, MOVE OVER

AAA Research Reveals That Some Drivers May Not Grasp the Danger They Pose To Those at the Roadside

by Ellen Edmonds, Manager, AAA Public Relations

AAA, September 29, 2021

<https://newsroom.aaa.com/2021/09/grim-reminder-latest-roadside-tragedies-under-score-need-for-drivers-to-slow-down-move-over/>

ORLANDO, Fla. (Sep. 29, 2021)—The recent deaths of two AAA tow providers, killed while assisting motorists, highlight just how dangerous it is for individuals who regularly work along the shoulders of America’s busy and congested roads.

Glenn Ewing, 32, was killed July 4 near Cincinnati, OH, while placing a disabled vehicle on the back of a flatbed on the side of the road. He leaves behind a fiancée and two children. Only three weeks later, 30-year-old David Meyer was assisting a driver on the left-hand shoulder in Castle Rock, CO, when he was also struck and killed. As of August of this year, 14 tow providers have been killed while helping others at the roadside in 2021.

“Deaths like these can be avoided if drivers slow down and move over to give these people room to work safely,” said Marshall Doney, AAA President and CEO. “We can’t stress enough how important it is to pay attention so you have time to change lanes when you see AAA, an emergency responder, or simply anybody along the side of the road.”

Startling new data from the AAA Foundation for Traffic Safety [<https://publicaffairsresources.aaa.biz/download/18733/>] finds that among drivers who do not comply with Move Over laws at all times:

- 42% thought this behavior was somewhat or not dangerous at all to roadside emergency workers. This demonstrates that drivers may not realize how risky it is for those working or stranded along highways and roads close to moving traffic.

An average of 24 emergency responders including tow providers are struck and killed by vehicles while working at the roadside each year—meaning someone in this line of work is killed, on average, every other week.

To protect these individuals, AAA and other traffic safety advocates have led the way in getting Move Over laws passed in all 50 states and the District of Columbia. Yet, the AAA Foundation finds that—

- nearly a quarter of those surveyed (23%) are unaware of the Move Over law in the state where they live, and
- among those who are aware of their state’s Move Over laws, about 15% report not understanding the potential consequences for violating the Move Over law at all.

In Colorado, for instance, drivers face a \$70 ticket, four penalty points, and a misdemeanor charge for failure to move over or slow down when approaching an emergency vehicle, tow truck, utility vehicle, or road maintenance vehicle with flashing lights on the side of the road. Ohio’s Move Over law requires all drivers to proceed with caution and if possible move over one lane when passing an emergency vehicle, tow truck, municipal vehicle, or road maintenance vehicle with flashing or rotating lights parked on the roadside, and violators can face fines up to \$300 for a first offense.

It’s not just tow providers and other emergency responders being killed on the side of the road. Since 2015, over 1,600 people have been struck and killed while outside of a disabled vehicle. The reality is that drivers are increasingly distracted while driving. Previous AAA Foundation research has found that drivers are up to four times as likely to crash if they are talking on a cell phone while driving and up to eight times as likely to be in a crash if texting.

“If you see something, anything, on the shoulder ahead, slow down and move over,” said Jake Nelson, AAA’s director of traffic safety advocacy and research. “It could literally save someone’s life.”

ABOUT SLOW DOWN, MOVE OVER

Since 2007, AAA has been instrumental in passing Move Over laws [<https://publicaffairsresources.aaa.biz/download/18736/>] in all states, including advocating for those laws to cover tow providers and other emergency responders. Additionally, AAA clubs have participated in educational and advocacy initiatives, creating public service announcements and reaching out to state officials. But, there is more work to be done. AAA is committed to raising awareness of the Move Over laws and the dangers associated with working at the roadside.

These laws require motorists to move over one lane or slow down when approaching an incident where tow providers, police, firefighters or emergency medical service crews are working at the roadside. Many states have also expanded their laws to cover other vehicles, such as utility and municipal (e.g. sanitation vehicles) fleets, as well as any disabled vehicle on the side of the road.

To protect roadside workers, drivers with disabled vehicles, and others, and to improve highway safety, AAA offers these precautionary tips:

- Remain alert, avoid distractions and focus on the task of driving.
- Keep an eye out for situations where emergency vehicles, tow trucks, utility service vehicles or disabled vehicles are stopped on the side of the road.
- When you see these situations, slow down and if possible move one lane over and away from the people and vehicles stopped at the side of the road.

Last year NHTSA and DOT committed to protecting first responders at the roadside [<https://newsroom.aaa.com/2020/12/aaa-commends-nhtsa-and-dot-on-commitment-to-protecting-first-responders-at-the-roadside/>] and it's important we all do our part to further this effort.

About the AAA Foundation for Traffic Safety: Established in 1947 by AAA, the AAA Foundation for Traffic Safety is a nonprofit, publicly funded, 501(c)(3) charitable research and educational organization. The AAA Foundation's mission is to prevent traffic deaths and injuries by researching their causes and by educating the public about strategies to prevent crashes and reduce injuries when they do occur. This research develops educational materials for drivers, pedestrians, bicyclists, and other road users.

About AAA: AAA provides more than 62 million members with automotive, travel, insurance, and financial services through its federation of 30 motor clubs and more than 1,000 branch offices across North America. Since 1902, the not-for-profit, fully tax-paying AAA has been a leader and advocate for safe mobility. Drivers can request roadside assistance, identify nearby gas prices, locate discounts, book a hotel or map a route via the AAA Mobile app. To join, visit AAA.com.

Article Entitled, “Your Car’s Emergency Flashers Could Get a Major Upgrade Soon—and Here’s Why,” by Mark Phelan, Detroit Free Press, December 5, 2020, Submitted for the Record by Hon. Sharice Davids of Kansas

YOUR CAR’S EMERGENCY FLASHERS COULD GET A MAJOR UPGRADE SOON—
AND HERE’S WHY

by Mark Phelan

Detroit Free Press, December 5, 2020

<https://www.freep.com/story/money/cars/mark-phelan/2020/12/05/car-emergency-flashers-upgrade-help/3821201001/>

One of the oldest—and possibly least effective—auto safety features may be getting a 21st-century upgrade.

A new system to improve the visibility of vehicles stranded by the side of the road could help reduce thousands of collisions and hundreds of deaths a year. The system could be available nearly immediately, if supplier Emergency Safety Solutions (ESS) gets regulatory approval.

“Vehicles on the side of the road pose a significant danger,” said Jake Fisher, director of automotive testing for Consumer Reports magazine. Fisher hasn’t evaluated Houston-based ESS’s system, but he liked the idea of updating emergency flashers quickly and inexpensively.

“We should absolutely look to see if emergency flashers are optimized,” he said. “There’s a big push for complicated auto safety systems. There are simple things we can do to save lives and make driving safer.”

More than 64,000 people have been involved this year in the United States in crashes with disabled vehicle, according to an ominous real time ticker on ESS's website [<https://www.ess-help.com/>].

70,000-PLUS CRASHES, 500-PLUS DEATHS

Every year from 2016 through 2018, nearly 72,000 people in the U.S. were involved in a crash that included a disabled vehicle, according to research ESS commissioned.

More than 14,000 people were injured and an average of 566 killed each year, according to the study. This year is tracking below those figures, possibly because pandemic shutdowns and precautions affected travel patterns.

“Our objective is to completely change how people receive information about roadside hazards,” ESS co-founder and COO Stephen Powers said. The company hopes to start that with a patented system that uses software to speed up emergency flashers from the current pace, which was set in 1951, when the U.S. National Highway Traffic Safety Administration wrote the regulation that still governs the lights.

The 70-year-old regulation was written when the speed at which incandescent bulbs could be switched on and off was the limiting factor and there'd been no research into what kind of lights work best to warn drivers, Powers said.

A DECEPTIVELY SIMPLE SOLUTION

Current emergency flashers blink at the same rate as turn signals, about 1.5 flashes per second. About 5 hertz—five flashes a second—is best, according to research ESS used to develop its system, which it calls the Hazard Enhanced Lighting Package (HELP). Even then, faster is better but only up to a point. Rates faster than five flashes per second become less effective for alerting people without distracting them.

ESS uses software to change how the vehicle's existing lights work. HELP works on any vehicle with LED lights and electronic controls that are common on new vehicles. It could be beamed into existing vehicles in a smartphone-style over the air software update, or built into vehicles' body control computer, Powers said. The over the air update could happen as soon as the feature gets NHTSA's approval.

That could come quickly if HELP is classified as a modification to an existing safety system rather than an all-new feature. That's possible because vehicles with the ESS system retain their old-style slower flashers for use when the vehicle is moving—going slowly up a long hill, for instance.

“We don't want to become a nuisance or something people ignore because they see it all the time on moving vehicles,” Powers said.

The 5 hertz flashes can only be activated when the vehicle is motionless. Pressing the existing flasher control once activates old-style flashing. A second push in a motionless vehicle accelerates to five cycles per second.

The fast lights are automatically activated if the vehicle's air bags deploy.

NHTSA is evaluating the system. There's no announced schedule for a decision, but Powers said it's a “front burner” item at the regulator. The company also is talking to European regulators.

WHY ARE POLICE FLASHERS DISTRACTING?

ESS also is working on digital alerts that could alert navigation systems like Waze when a vehicle is disabled on the side of the road.

“We're working with tech companies to make that communication widespread, even without (direct) vehicle-to-vehicle communication,” Powers said.

ESS will license its intellectual property to manufacturers who want the feature. The company has 46 patents, covering its concept and technology in every major automaking and auto buying country.

The quicker flashes do not mimic the sometimes disorientating pattern of lights on police cars, Powers said. The police lights flash the lights on a rooftop lightbar and conventional lights at different times, a pattern that's reserved for emergency vehicles.

HELP is less distracting because of its flash rate, single color and the “outlining effect,” which Powers said allows people to identify the shape and location of a vehicle more easily when all the lights flash at the same time.

No automaker has committed to using the system, but ESS is talking with several and expects quick implementation when it gets regulatory approval.



Article Entitled, “Stopped-vehicle Crashes Result in Hundreds of Fatalities Per Year,” Insurance Institute for Highway Safety, Highway Loss Data Institute, June 3, 2021, Submitted for the Record by Hon. Sharice Davids of Kansas

STOPPED-VEHICLE CRASHES RESULT IN HUNDREDS OF FATALITIES PER YEAR

Insurance Institute for Highway Safety, Highway Loss Data Institute, June 3, 2021
<https://www.iihs.org/news/detail/stopped-vehicle-crashes-result-in-hundreds-of-fatalities-per-year>

Hundreds of people are killed and thousands are injured each year in crashes involving stopped or disabled vehicles that may not have stood out enough to alert drivers to the danger they pose, according to a new study commissioned by a company that makes enhanced hazard lighting systems.

Using federal crash statistics, transportation data analysis firm Impact Research estimated that 566 people were killed and 14,371 injured each year over 2016–18 in crashes on all types of roads involving a disabled vehicle in which visibility was likely a factor. The annual societal cost of those crashes totaled around \$8.8 billion in medical payments, lost wages, and the less easily quantified costs of death or disability.

“This study identifies a part of the road safety equation that doesn’t get much attention, despite the size of the problem,” says David Zuby, executive vice president and chief research officer at the Insurance Institute for Highway Safety.

The federal crash databases include codes denoting crashes that involve stopped or disabled vehicles. To estimate how many of those might have resulted because the stationary vehicle wasn’t conspicuous enough, the authors analyzed detailed police reports from a subset of Florida crashes to determine the percentages of different types of collisions that involved a stopped vehicle that was too difficult for other drivers to see. Then they applied those percentages to the broader data set.

They found that 95 percent of these inconspicuous-vehicle crashes occur when a vehicle traveling down the roadway collides with a stationary one. However, more than half the deaths and almost 1 in 5 serious injuries occur when a vehicle strikes a pedestrian who is leaving, working on, or returning to a stopped vehicle. On average, this type of crash kills 300 pedestrians a year, a number that has risen by more than a quarter since 2014.

That increase comes amid a steady rise in pedestrian fatalities, generally. Overall, 6,205 pedestrians were killed on U.S. roads in 2019, up from just 4,109 a decade earlier. An earlier IIHS study [<https://www.iihs.org/news/detail/land-use-plays-a-role-in-pedestrian-freeway-fatalities>] found that around 800 pedestrians a year are killed on U.S. interstates and other freeways—about 18 percent of them due to a disabled vehicle.

“These crashes illustrate the potential value of stopped-vehicle-ahead warnings, which are already provided by some navigation apps and could be integrated to work with advanced driver assistance features and more advanced driving automation,” Zuby says. “They’re also a reminder of why we put so much emphasis on good headlights as a vital crash avoidance technology.”

Crashes like these could potentially be eliminated with vehicle-to-vehicle communication, which enables vehicles to wirelessly exchange information about their speed, location, and heading. But long before that technology becomes commonplace, several simpler countermeasures could help, the report suggests.

Earlier research indicates that improving hazard lights so they flash brighter and more frequently and are triggered automatically in the event a vehicle is disabled could reduce crashes. Nearly a third of the collisions in that study involved a stationary vehicle that had its hazards on. Emergency Safety Solutions, which commissioned the Impact Research report, makes one such enhanced hazard lighting system.

Adjustments to the “move over” laws that require drivers to change lanes to give police and emergency services vehicles more room to operate could also help, Impact Research concluded. Such laws are now in place in all 50 U.S. states. But first responders continue to be killed and injured in secondary crashes, prompting the U.S. Government Accountability Office to announce in June 2019 that it would conduct a study to review what might be done to make these laws more effective.

Better traffic management practices could also make a difference. Under one such policy, first responders dispatch two vehicles to every highway incident and use one vehicle primarily to shield the personnel working on the disabled vehicle from oncoming traffic, increasing the visibility of the scene with flares, safety cones and flashing lights.

However, more research is needed there, as well. The most recent Federal Highway Administration report on the subject was written in 2010, before many relevant technologies became available, and its authors were unable to identify specific traffic management procedures that were most effective in preventing secondary crashes.

APPENDIX

QUESTION FROM HON. HENRY C. “HANK” JOHNSON, JR. TO HON. MARTHA CASTEX-TATUM, VICE MAYOR PRO TEMPORE, HOUSTON, TX, AND COUNCILMEMBER, DISTRICT K, HOUSTON, TX, ON BEHALF OF THE NATIONAL LEAGUE OF CITIES

Question 1. African Americans make up the majority of pedestrian and cycling fatalities. Furthermore, both pedestrian and cycling fatalities are skyrocketing due to numerous factors, including distracted driving and a shift toward SUVs, which create greater blind spots and heavier impact from collisions. That said, we know that relatively cheap and quick infrastructure improvements such as building sidewalks and protected bike lanes can help prevent cycling and pedestrian fatalities, and the disproportionate loss of Black and minority lives.

Why not invest in existing safety measures to save lives, especially for people of color who are disproportionately impacted, rather than rely upon the potential for safety that may or may not transpire from the usage of AVs?

ANSWER. Congressman Johnson, we absolutely should be investing in proven safety solutions on our roads to save lives today, and cities like Houston are continuing to do that with our Vision Zero efforts and our transportation investments across our neighborhoods. We’re also looking forward to doing more with the new “Safer Streets and Roads for All” program once USDOT is able to stand that up. While AVs may help with safer driving in the near future, we have to use a full “Safe System” wrap-around approach to combat the rising deaths on our roads and that means doing far more—on roads, with vehicles and with our communities.

QUESTION FROM HON. SHARICE DAVIDS TO SCOTT MARLER, DIRECTOR, IOWA DEPARTMENT OF TRANSPORTATION, ON BEHALF OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

Question 1. Conversations around AVs are important, but I also don’t want to lose sight of the need to address critical safety issues now. For example, crashes involving disabled vehicles are happening regularly. Anyone that’s ever had a flat tire or had to walk to get help knows just how frightening it can be. And sadly, tragedies continue.

Just this last August, a Kansas man was killed after he had a tire blowout on I-70 just over the border in Missouri. An oncoming vehicle wasn’t able to stop in time and he was tragically struck and killed. This is just one example of the thousands of injuries and fatalities happening every year. In fact, every seven minutes, a disabled vehicle is struck by an oncoming driver on U.S. roadways. I’d like to include for the record a few articles highlighting the significant safety challenge of these crashes and how technology that is available today can help oncoming drivers see these vehicles before it’s too late to react.

I’m wondering whether we’re doing enough to address this challenge in the interim before AVs are prevalent.

Mr. Marler, are you seeing these types of crashes in your state? What is the impact?

ANSWER. Thank you, Representative Davids, for your question. Unfortunately, Iowa is experiencing crashes like the one you describe where there is a vehicle (disabled or not) stopped on the side of the roadway and then another vehicle moving at speed collides with it, resulting in a serious injury or fatality. All fatalities are unacceptable on our roadways and Iowa DOT is doing everything we can to eliminate the crashes you described and all crashes for that matter.

There are a range of actions that a state can take to mitigate and eliminate these types of crashes. First, states can enact and then educate drivers about laws requiring them to move over or slow down to provide room to vehicles and people who are stopped on the side of the roadway. These laws are designed to protect motorists, including motorists stranded by the side of the road, persons being transported

in emergency vehicles, and personnel at high risk while performing their duties on Iowa's roadways. A good rule of the road is to change lanes or slow down anytime you are approaching a vehicle that is slow moving, stopped or stranded on the shoulder, if you can safely do so. Iowa enacted its Move Over or Slow Down¹ law in 2018 and now has an aggressive campaign to educate the public about the law and impose penalties to motorists who do not follow the law.

Second, states can further improve the infrastructure so that motorists can better perceive lane markings on roadways, maintain variable message signs so motorists know a disabled vehicle is ahead, and install static signs to educate and remind motorists of the Move Over or Slow Down law.

Third, technology will play an important role in mitigating and eliminating these types of crashes. More vehicles are being equipped with advanced driver assistance systems, including technologies that warn drivers of lane deviation, display upcoming roadside hazards to the driver, and prevent and reduce the severity of crashes through automatic emergency braking.

All of these efforts are happening now and will prevent many crashes from occurring until such time as connected and automated vehicles (CAVs) are operating on our roadways. In the future, CAVs will be an important tool in preventing these types of crashes. A connected vehicle should know the precise location of a disabled vehicle, with this information being relayed to the driver and/or the automated systems on board to help prevent a collision with the disabled vehicle. In fact, this technology and application could be used for other situations as well, such as informing drivers of an unexpected vehicle queue and work zones to better indicate where there is active and inactive construction occurring.

QUESTION FROM HON. SAM GRAVES TO SCOTT MARLER, DIRECTOR, IOWA DEPARTMENT OF TRANSPORTATION, ON BEHALF OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

Question 2. Please explain some of the safety and mobility improvements Automated Vehicles (AVs) can bring to rural areas.

ANSWER. Thank you, Representative Graves, for your question. CAV technologies have the potential to improve mobility, access, and equity and help engage disadvantaged and marginalized communities regardless of their geographic location. State DOTs, like Iowa DOT, and their partners recognize the role transportation plays broadly in society, its ability to connect communities, as well as inequities from the 20th century when building out the nation's transportation system. In the United States, CAV technologies need to benefit all users of the transportation system regardless of their income levels or geographic location.

Specific to rural areas, I would like to draw your attention to recently completed research that answers your question in greater detail. *Consideration of Automated Vehicle Benefits and Research Needs for Rural America*, provides information regarding the safety and mobility improvements AVs bring to rural areas.² The authors consider the importance and magnitude of improved: a) safety, b) mobility and accessibility, and c) traffic operations and energy efficiency—three commonly cited benefits attributed to automation—for rural areas in the continental United States. They focus on the benefits that are inherent to vehicle automation and thus can be achieved with any shared or private ownership and use schemes, and I would like to utilize their report to explain some of the safety and mobility improvements that may be expected from CAVs in rural areas.

In this report, the authors state that rural crash fatality and serious injury rates are nearly three times as high in rural versus urban areas. There are a wide variety of factors that contribute to this statistic including speed and risk-taking behavior; the nature of rural roads with undivided opposing direction traffic streams that make head-on collisions more likely; and driver behavior concerns which include more frequent inebriation and an older population that experiences a higher crash involvement rate than middle-aged drivers. All of these factors could be addressed through automation. In addition, crash avoidance could be especially beneficial since there are longer response times for emergency personnel.

For mobility, the authors focus on the limited accessibility that rural populations have to various destination types, low density development patterns, and a population that is, on average, older than those in suburban and urban areas. These factors all contribute to a significant car dependency in rural areas and lead to long

¹ <https://iowadot.gov/rules>

² Dowds, Jonathan, et. al., *Consideration of Automated Vehicle Benefits and Research Needs for Rural America*, pages 2–4, July 2021. <https://escholarship.org/content/qt4v25q5n9/qt4v25q5n9.pdf?t=qxoumb>. Accessed March 10, 2022.

distances that are hard to serve by walking and biking and also lower total demand that is more difficult to serve with transit, ride-hailing, or ride-sharing. In these situations, eliminating the burden of driving longer distances and the ability to send a vehicle on an unoccupied errand may be particularly important in rural areas.

Finally, for traffic operations and energy efficiency, near-universal AV adoption, especially with connected automated vehicles, could lead to reduced vehicle size and weight without adversely impacting safety outcomes. This could result in closer following distances, smoother traffic flows, and reduced crash rates, thereby increasing lane capacity and reducing congestion at high-volume rural locations and intersections.

In Iowa, we are specifically addressing the mobility and accessibility aspect head-on where our research partners at the University of Iowa's National Advanced Driving Simulator were awarded one of the eight Automated Driving System (ADS) demonstration grants from USDOT.³ While 19 percent of Americans live in rural areas, 68 percent of our nation's total lane miles are in rural areas, and 45 percent of all traffic related fatalities occur on rural roadways.⁴ Iowa's population is aging, and it remains paramount that older individuals have the ability to get to the important services they need, such as healthcare which is being regionalized. The ADS for Rural America project is a demonstration project that involves a highly automated shuttle bus with advanced sensors. This automated vehicle is now being driven on all types of rural roads in Iowa including gravel roads and paved unmarked roadways. The goal is to understand the unique challenges that rural roadways present for automated vehicles as well as identify opportunities for advancing automation so that it improves safety and mobility for everyone, especially the mobility challenged populations in rural America.

QUESTIONS FROM HON. HENRY C. "HANK" JOHNSON, JR. TO SCOTT MARLER, DIRECTOR, IOWA DEPARTMENT OF TRANSPORTATION, ON BEHALF OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

Question 3. Are you aware of efforts by states around the country to preempt local authority over AV operations? These laws undermine local control and make it difficult for local communities to ensure the safe operation of AVs in their communities, and therefore the safety of their residents.

Mr. Marler: Do you support such efforts and why? Do you agree the consequences of these laws can be dire?

ANSWER. Thank you, Representative Johnson, for your question. The National Conference of State Legislatures (NCSL) maintains a robust and curated database of self-driving vehicles enacted legislation that provides up-to-date, real-time information about state autonomous vehicle legislation that has been introduced in the 50 states, the District of Columbia, and territories⁵. The legislation passed to date includes a wide range of laws that enable the safe testing and deployment of automated vehicles on public roadways. And, there are examples where state legislatures have passed laws that preempt local jurisdictions from regulating AVs, including Illinois, Nevada, North Carolina, Oklahoma, Texas, and Utah.

The enactment of laws regulating automated vehicles at the state level is an issue of serious importance to our local partners and the state DOTs as infrastructure owners and operators recognize this concern. Speaking from the perspective of a state DOT, we believe that the traditional framework that has laid out specific responsibilities among federal, state, and local authorities regarding the certification, titling, licensing, and development/enforcement of traffic laws should not be changed. The National Highway Traffic Safety Administration (NHTSA) has the authority to regulate the design and safety of vehicles through the Federal Motor Vehicle Safety Standards (FMVSS). The Federal Highway Administration (FHWA) has the authority, via the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), to define the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public travel. States have the authority to title and license vehicles on roadways.

States and local jurisdictions have a shared responsibility to develop and enforce traffic laws that govern the safe operation of vehicles on our roadways. In fact, many states, including Iowa, do have provisions in their state law for local jurisdictions to make certain decisions. This framework has worked well since it was first

³ <https://www.transportation.gov/av/grants>. Accessed January 28, 2022.

⁴ <https://www.bts.gov/rural>. Accessed January 28, 2022.

⁵ <https://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx>. Accessed March 12, 2022.

established, and the state DOTs intend to maintain this distribution of responsibilities going forward. We do recognize that this framework may need to be revisited in some aspect in the future once Level 4 and 5 autonomous vehicles are ready for deployment (not development or testing) on roadways. The state DOTs, working through the National Cooperative Highway Research Program (NCHRP) project 20–102(7) *Implications of Automation for Motor Vehicle Codes*, has started to research and assess what changes, if any, may need to be made in the future.⁶

Question 4. For example, in 2018, Elaine Herzberg was killed when a self-driving car crashed into her. It was later reported that the vehicle had numerous safety flaws—its software was designed not to see people who were “jaywalking”, and the safety drivers were found to have been distracted. Arizona state laws, under Governor Ducey, adopted a more lenient approach to regulating AVs, so that car makers were not held to the highest safety standards.

Mr. Marler: Should there be a federal role in ensuring a minimum level of regulation of AVs so that no state level preemption could endanger people’s safety?

ANSWER. Thank you, Representative Johnson, for your question. The situation you refer to regarding the tragic death of Elaine Herzberg occurred when the self-driving car was being tested on the public roadway. The American Association of Motor Vehicle Administrators (AAMVA) has published, and updated, their *Safe Testing and Deployment of Vehicles Equipped with Automated Driving Systems Guidelines*, which provides important guidelines for jurisdictions to consider in the testing and deployment of automated vehicles. As stated in this document, a successful path to the safe testing and deployment of technology in vehicles must include appropriate government oversight developed in coordination with strong stakeholder engagement formed through partnerships with the many entities engaged in or affected by these rapidly developing technologies. These partnerships should be formed to address the far-reaching impacts of the technologies and should include representatives from a broad spectrum of government organizations, government support associations, and industry and advocacy groups.⁷

Question 5. What would that regulation look like?

ANSWER. The state DOTs believe that the traditional framework that has laid out specific responsibilities among federal, state, and local authorities regarding the certification, titling, licensing, and development/enforcement of traffic laws should not be changed. The National Highway Traffic Safety Administration (NHTSA) has the authority to regulate the design and safety of vehicles through the Federal Motor Vehicle Safety Standards (FMVSS). The Federal Highway Administration (FHWA) has the authority, via the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), to define the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bike-ways, and private roads open to public travel. States have the authority to title and license vehicles on roadways as well as limit and authorize the testing and deployment of AVs on their roadways. The role of the federal government should be to continue updating the FMVSS to ensure the safety of the vehicles, be they automated or non-automated, and to continue to define the standards used by road managers nationwide.

Another role that the federal government can play is to continue updating of the National Motor Vehicle Title Information System (NMVTIS). The NMVTIS is designed to protect consumers from fraud and unsafe vehicles and to keep stolen vehicles from being resold and is also a tool that assists states and law enforcement in deterring and preventing title fraud and other crimes.

As vehicles change and more information is needed to title a vehicle, this should be updated as part of the NMVTIS. Specifically, if a vehicle is known to be an automated vehicle, it should be captured on the vehicle title such that if the vehicle moves state-to-state, the new state knows it. The NMVTIS is set up as a national system, but the states contribute the data on individual vehicle transactions. This is another example of a federal-state partnership or shared responsibility that needs to continue and be strengthened for the future as AVs are deployed.

⁶ <https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4006>. Accessed March 10, 2022.

⁷ American Association of Motor Vehicle Administrators, *Safe Testing and Deployment of Vehicles Equipped with Automated Driving Systems Guidelines*, Edition 2. September 2020. https://www.aamva.org/getmedia/66190412-ce9d-4a3d-8b6e-28c1b80e3c10/Safe-Testing-and-Deployment-of-Vehicles-Equipped-with-ADS-Guidelines_Final.pdf. Accessed March 10, 2022.

QUESTION FROM HON. NIKEMA WILLIAMS TO JOHN SAMUELSEN, INTERNATIONAL PRESIDENT, TRANSPORT WORKERS UNION OF AMERICA, AFL–CIO

Question 1. Mr. Samuelsen, in your testimony, you mentioned the need to protect equity and accessibility for consumers when it comes to technological innovation.

What are the key policy considerations for Congress in this area when it comes to automated vehicle technology?

ANSWER. As we have seen from other recent transportation innovations, unregulated industries tend to ignore equity and accessibility until they are forced to address these issues. Transportation Network Companies like Uber and Lyft are actively arguing in court that they are not bound by federal requirements to provide accessible services.¹ At the same time, these ride-hailing companies “deepen the desperation of workers who have been excluded from traditional employment”², specifically people of color, by both selling a product significantly more expensive than other competing modes of transportation and undermining the value of work disproportionately performed by historically disadvantaged groups.³ There is no doubt that, left unregulated, the nascent AV industry will follow a similar path.

To avoid this outcome, Congress should focus on the following considerations as you prepare AV legislation and oversight actions:

- *Hold AVs to existing standards.* AV companies have already submitted exemption and waiver requests from hundreds of federal standards. These standards, including equity and accessibility requirements, are established in law to prevent unequal and unsafe outcomes. Any new technology that seeks federal approval should be required to meet these standards before widespread deployment.
- *Prioritize the voices of working people.* Most frontline workers employed by public transportation agencies are people of color. The good, union jobs these workers have are well-established pathways to the middle class and towards creating generational wealth. These workers have an essential role to play in technology development that maintains and expands their existing employment.
- *Build standards now for the industry to grow around.* As mentioned above, unregulated industries will inevitably undermine equitable outcomes and reduce accessibility. Congress has the opportunity now, before the AV industry deploys a significant number of vehicles into our transportation systems, to establish clear standards and expectations for the industry to grow around. Requiring these companies to develop technology towards equitable outcomes is much easier today than it will be in ten years.

Additionally, the TWU’s comments in response to the DOT’s recent RFI on Transportation Equity Data⁴ include more policy suggestions applicable to the entire transportation system. These recommendations, while more general, would also buoy efforts to ensure AVs are developed inclusively.

QUESTION FROM HON. EDDIE BERNICE JOHNSON TO JOHN SAMUELSEN, INTERNATIONAL PRESIDENT, TRANSPORT WORKERS UNION OF AMERICA, AFL–CIO

Question 2. Mr. Samuelsen, the commercial aircraft industry has had some version of autopilot for many years; however, two pilots are still required in the cockpit and those pilots routinely take over to manually fly our planes.

Do you believe that we should also require human operators in commercial vehicles on our roads as this technology advances?

ANSWER. Yes. Automations fail on a regular basis. We have to expect and plan for those failures if we are going to maintain a safe transportation system. Both the FAA and FRA acknowledge this fact and require human oversight of automated systems. These agencies also required well-trained, well-qualified workers to be ready to take control of their vehicles at all times, as needed. The same approach should be taken for automations on commercial vehicles travelling our roads.

Human judgement from a well-trained operator saves lives. This is especially true during crises which, by their nature, are unexpected and impossible to program solutions to. For example, on September 11, 2001, TWU members were ordered by management to stop service to downtown Manhattan—effectively trapping thousands of people under the World Trade Center. Subway and bus operators ignored that order and returned time again, risking their own lives and their jobs, to shuttle

¹ <https://www.fastcompany.com/90343921/lyft-claims-its-not-a-transportation-company-to-avoid-ada-compliance>

² <https://www.nelp.org/wp-content/uploads/People-v.-Uber-Lyft-Application-Amici-Curiae.pdf>

³ <https://ttd.org/the-cost-of-doing-business/>

⁴ https://downloads.regulations.gov/DOT-OST-2021-0056-0291/attachment__1.pdf

people out of the area. The last subway pulled out of the World Trade Center station just minutes before the towers collapsed, filled to capacity with people who might not otherwise have been able to get away. Without the compassion and ingenuity demonstrated by TWU members that day, capacities that AVs will never possess, we would have lost many more lives in that attack.

QUESTION FROM HON. RODNEY DAVIS TO JOHN SAMUELSEN, INTERNATIONAL PRESIDENT, TRANSPORT WORKERS UNION OF AMERICA, AFL-CIO

Question 3. Are your members opposed to AV legislation or to transportation innovation generally?

ANSWER. No, on the contrary we are active and enthusiastic supporters of pro-worker innovation. Our members regularly spend their own bargaining power during contract negotiations to force our employers to upgrade to new technology. Transit agencies across the country would still be waiting to implement blind spot detection, lane assist, and other recent innovations if not for the TWU forcing these agencies to buy and install these vital systems. We would love to see a bill passed into law this Congress that establishes a regulatory regime that the AV industry can grow around; one that maintains safety standards, protects workers, and ensures that this technology creates jobs in America.

QUESTIONS FROM HON. ELEANOR HOLMES NORTON TO CATHERINE CHASE, PRESIDENT, ADVOCATES FOR HIGHWAY AND AUTO SAFETY

Question 1. Ms. Chase, your testimony notes that automated driving technology has the potential to improve roadway safety and reduce deaths and injuries. However, your testimony also notes that there's often confusion between the potential safety benefits of commercial AVs and safety benefits offered by partial automation convenience features, such as automatic emergency braking.

Can you elaborate on this distinction?

ANSWER. Currently there are no federal performance standards for autonomous vehicles (AVs), advanced driver assistance systems (ADAS), or partial automation convenience features. Understandably, there is a great deal of confusion among the public about these different categories. In an actual AV, the car is taking over the entire driving task, unlike ADAS and convenience features where a driver always must be engaged in the driving task. There are no AVs available to consumers at this time. ADAS include safety features presently offered in some vehicles such as automatic emergency braking (AEB), lane departure warning (LDW) and blind spot detection (BSD). The Insurance Institute for Highway Safety (IIHS) has found that equipping large trucks with forward collision warning and AEB could eliminate more than two out of five crashes in which a large truck rear-ends another vehicle.¹

Conversely, partial automation convenience features, such as adaptive cruise control (ACC) and lane centering used together, have not been proven to improve vehicle safety. According to IIHS President David Harkey, "[T]here is no evidence that [partial automation systems] make driving safer . . . In fact, the opposite may be the case if systems lack adequate safeguards."² Misuse of and overreliance on some technologies already have led to numerous fatal crashes.³

Advocates commend this Subcommittee and the full Committee on Transportation and Infrastructure for including numerous provisions in the Infrastructure Investment and Jobs Act (IIJA), signed into law last November, that will improve safety and strengthen our nation's infrastructure.⁴ The law requires the U.S. Department of Transportation (DOT) to issue a final rule within two years for AEB in large commercial motor vehicles (CMVs) and the issuance of a Federal Motor Carrier Safety Regulation (FMCSR) to require drivers use AEB.⁵ We urge the U.S. DOT to meet the statutory deadline for this standard and not delay regulatory action. However, this directive must be expanded to include all CMVs and the U.S. DOT has the authority to do so. Based on new truck sales data, limiting the installation of AEB to Class 7 and 8 trucks will potentially exclude over half a million Class 3–6 trucks every year. These vehicles travel on local streets and through neighborhoods everyday making millions of deliveries. Equipping these trucks with

¹ IIHS, Study shows front crash prevention works for large trucks too, available at: <https://www.iihs.org/news/detail/study-shows-front-crash-prevention-works-for-large-trucks-too>

² IIHS, IIHS creates safeguard ratings for partial automation (Jan. 20, 2022).

³ Collision Between Vehicle Controlled by Developmental Automated Driving System and Pedestrian, Tempe, Arizona, March 18, 2018, Accident Report NTSB/HAR-19/03 (Nov. 19, 2019); NHTSA Office of Defects Investigation Preliminary Evaluation PE21-020.

⁴ Pub. L. 117-58 (2021).

⁵ *Id.* at Sec. 23010.

AEB will make neighborhood streets safer for pedestrians, bicyclists, children, older adults, people in wheelchairs and other vulnerable road users. Advocates also has consistently supported the use of speed limiting devices for CMVs because high speed crashes involving large trucks have the potential to be far deadlier than those that occur at lower speeds.⁶

Question 2. How should Congress treat automated vehicle technologies that can be adopted today to improve safety on U.S. roads versus more advanced levels of automation which supersede the need for a human driver?

ANSWER. While autonomous vehicle (AV) technology continues to be developed, advanced driver assistance systems (ADAS) are available to immediately improve public safety. These safety technologies can address a range of crash causes including impaired, distracted and drowsy driving. In fact, the National Transportation Safety Board (NTSB) has included increasing implementation of collision avoidance technologies in its Most Wanted Lists of Transportation Safety Improvements since 2016.⁷ However, the widespread use of these technologies and realizing their significant lifesaving benefits are hampered by their limited availability to consumers typically in higher end models or in luxury packages with non-safety features at a significant additional cost. Moreover, there are currently no minimum safety standards to ensure the technologies perform as expected and needed.

In the near term, regulations must be promulgated for elements of autonomous commercial motor vehicles (ACMVs) including but not limited to the autonomous driving system (ADS), human machine interface, sensors, privacy, software and cybersecurity. ACMVs must also be subject to a “vision test” to guarantee they properly detect and respond to other vehicles, all people and objects in the operating environment. Also, a standard to ensure ACMVs do not go outside of their operational design domain (ODD) should be issued. Standards for ACMVs must be required to be issued by specific deadlines, with a compliance date, set by Congress before deployment.

For the foreseeable future, regardless of their level of automation, ACMVs must have an operator with a valid CDL in the vehicle at all times. Drivers will need to be alert to oversee not only the standard operations of the truck but also the ADS. Therefore, the Secretary must issue a mandatory safety standard for driver engagement. In addition, critical safety regulations administered by FMCSA such as those that apply to driver hours of service (HOS), licensing requirements, entry level training and medical qualifications must not be weakened.

Drivers operating an ACMV must have an additional endorsement or equivalent certification on their commercial driver’s license (CDL) to ensure they have been properly trained to safely oversee and understand the ODD of the vehicle and, if need be, to operate an ACMV. This training must include a minimum number of hours of behind-the-wheel training.

Each manufacturer of an ACMV must be required to submit a safety assessment report that details the safety performance of its automated driving systems and automated vehicles. Manufacturers must be required to promptly report to the National Highway Traffic Safety Administration (NHTSA) all crashes involving ACMVs causing fatalities, injuries and property damage, which the agency should make publicly available shortly upon receipt.

ACMVs that do not comply with Federal Motor Vehicle Safety Standards (FMVSS) must not be introduced into commerce nor be subject to large-scale exemptions from such. Any safety defect involving the ACMV must be remedied before the ACMV is permitted to return to operation. The potential for defects to infect an entire fleet of vehicles is heightened because of the connected nature of AV technology. Therefore, manufacturers must be required to promptly determine if a defect affects an entire fleet. Those defects which are fleet-wide must result in notice to all such owners and an immediate suspension of operation of the entire fleet until the defect is remedied.

The United States Department of Transportation (U.S. DOT) Secretary must be required to establish a public searchable database for ACMVs that includes such information as the vehicle’s identification number; manufacturer, make, model and trim information; the level of automation of each automated driving system with which the vehicle is equipped; the ODD of each automated driving system; and the FMVSS, if any, from which the vehicle has been exempted.

Motor carriers using ACMVs must be required to apply for additional operating authority. In addition, FMCSA must consider the additional measures that will be needed to ensure that ACMVs respond to state and local law enforcement authori-

⁶Docket: FMCSA–2014–0083, Comment ID: FMCSA–2014–0083–4459.

⁷NTSB Most Wanted List Archives, https://ntsb.gov/safety/mwl/Pages/mwl_archive.aspx.

ties and requirements, and what measures must be taken to properly evaluate an ACMV during roadside inspections. In particular, the safety impacts on passenger vehicle traffic of several large ACMVs platooning on bridges, roads and highways must be assessed.

NHTSA must be given imminent hazard authority to protect against potentially widespread catastrophic defects with ACMVs and the authority to impose criminal penalties to ensure manufacturers do not willfully and knowingly put defective ACMVs into the marketplace.

NHTSA and FMCSA must be given additional resources, funding and personnel, in order to meet demands being placed on the agency due to the advent of AV technology. Without these necessary safety protections, mandated by Congress to assure they are adopted with prescribed deadlines, commercial drivers and those with whom they share the road are at risk. Allowing technology to be deployed without rigorous testing, vigilant oversight, consumer information and comprehensive safety standards is a direct and unacceptable threat to the motoring public.

Question 3. What can Congress do now to ensure the safe deployment of commercial AVs, when the time comes?

ANSWER. Automated technology may have the potential to be transformative in reducing our nation's mounting roadway death and injury toll. However, we are deeply concerned about the future of automated, or autonomous, vehicles (AVs) including trucks and buses without targeted legislative directives requiring regulatory and industry actions to address identified problems. The lack of comprehensive federal performance standards, strong government oversight, adequate consumer information, and effective industry accountability imperils all road users who are currently unknowing and unwitting participants in the testing of experimental autonomous technology on public roadways. Therefore, Congress must exercise stringent oversight, demand transparency from all stakeholders, ensure industry accountability and advance comprehensive legislation directing the issuance of minimum performance standards to ensure public safety.

QUESTION FROM HON. SHARICE DAVIDS TO CATHERINE CHASE, PRESIDENT,
ADVOCATES FOR HIGHWAY AND AUTO SAFETY

Question 4. Conversations around AVs are important, but I also don't want to lose sight of the need to address critical safety issues now. For example, crashes involving disabled vehicles are happening regularly. Anyone that's ever had a flat tire or had to walk to get help knows just how frightening it can be. And sadly, tragedies continue.

Just this last August, a Kansas man was killed after he had a tire blowout on I-70 just over the border in Missouri. An oncoming vehicle wasn't able to stop in time and he was tragically struck and killed. This is just one example of the thousands of injuries and fatalities happening every year. In fact, every seven minutes, a disabled vehicle is struck by an oncoming driver on U.S. roadways. I'd like to include for the record a few articles highlighting the significant safety challenge of these crashes and how technology that is available today can help oncoming drivers see these vehicles before it's too late to react.

I'm wondering whether we're doing enough to address this challenge in the interim before AVs are prevalent.

Cathy Chase, why is it important to incentivize new technologies now while we wait for full deployment of AVs?

ANSWER. Preventable crashes such as those involving disabled vehicles are tragic especially when proven solutions are currently available. Data recently released by the National Highway Traffic Safety Administration (NHTSA) revealed that 38,824 people were killed in motor vehicle crashes in 2020. The fatality rate increased by 21 percent and is the highest annual total since 2007. This number is especially stunning considering the estimated number of police-reported crashes and injuries decreased, by 22 and 17 percent respectively. In nearly half (45 percent) of the fatal crashes, speeding, impaired driving and unbuckled drivers were involved. Fatalities of vulnerable road users—bicyclists, pedestrians and motorcyclists—also rose to historic levels.

The United States Department of Transportation (DOT) should be issuing minimum performance standards for proven and available safety technologies with urgency. NHTSA has estimated that between 1960 and 2012, over 600,000 lives were saved by motor vehicle safety technologies.⁸ The National Transportation Safety

⁸Lives Saved by Vehicle Safety Technologies and Associated Federal Motor Vehicle Safety Standards, 1960 to 2012, DOT HS 812 069 (NHTSA, 2015); See also, NHTSA AV Policy, Executive Summary, p. 5 endnote 1.

Board (NTSB) has included increasing implementation of collision avoidance technologies in its Most Wanted Lists of Transportation Safety Improvements since 2016.⁹ In addition, the Insurance Institute for Highway Safety (IIHS) has found that equipping large trucks with forward collision warning and AEB could eliminate more than two out of five crashes in which a large truck rear-ends another vehicle, and AEB can decrease front-to-rear crashes with injuries by 56 percent for passenger motor vehicles.¹⁰

The widespread use of these technologies and realizing their significant lifesaving benefits are hampered by their limited availability to consumers. Often AEB is sold as part of an additional, expensive trim package along with other non-safety features, or included as standard equipment in high end models or vehicles. This practice hinders mass dissemination and safety equity by providing access only to those who can afford an upcharge of thousands of dollars. Additionally, segments of the trucking industry have opposed requiring AEB in small to medium-sized trucks.

There are currently no minimum safety standards to ensure the technologies perform as expected and needed. When consumers walk into auto showrooms to purchase a vehicle, a major expenditure for most families, they expect the assurances of minimum safety standards to protect them, as has been the case since the first federal vehicle safety regulation was issued in 1966. Also, consumers are keeping cars longer. In 2021, the average of age of vehicles operated on roads in the U.S. was 12 years.¹¹ As such, without federal regulations requiring ADAS as standard equipment, it will take far longer for these safety systems to be prevalent on our roadways. The current void of regulations for ADAS renders all road users vulnerable to needless dangers, including bicyclists, pedestrians and other vulnerable road users.

QUESTION FROM HON. HENRY C. “HANK” JOHNSON, JR. TO CATHERINE CHASE,
PRESIDENT, ADVOCATES FOR HIGHWAY AND AUTO SAFETY

Question 5. African Americans make up the majority of pedestrian and cycling fatalities. Furthermore, both pedestrian and cycling fatalities are skyrocketing due to numerous factors, including distracted driving and a shift toward SUVs, which create greater blind spots and heavier impact from collisions. That said, we know that relatively cheap and quick infrastructure improvements such as building sidewalks and protected bike lanes can help prevent cycling and pedestrian fatalities, and the disproportionate loss of Black and minority lives.

Ms. Chase: What regulation is needed to enforce traffic laws and ensure that AVs don't drive recklessly?

ANSWER. According to the U.S. Department of Transportation (U.S. DOT) National Roadway Safety Strategy, fatalities among Black people increased by 23 percent between 2019 and 2020 compared to an overall increase of 7.2 percent.¹² In addition, people who are American Indian and Alaska Native have roadway fatality rates more than double the national rate on a per population basis.¹³ Moreover, the 40 percent of counties with the highest poverty rates in 2019 experienced a fatality rate 35 percent higher than the national average on a per population basis.¹⁴

Several actions can be taken to reverse these deeply troubling figures. Restrictions on the use of federal dollars by local communities to use automated enforcement (AE) should be removed. Research has consistently demonstrated the safety benefits of AE.¹⁵ The Infrastructure Investment and Jobs Act (IIJA) revised the misguided limitation by permitting the use of federal funds for AE in work and school zones but not elsewhere.¹⁶ This restriction should be stricken in its entirety. In 2018, Advocates, the American Automobile Association (AAA), the Insurance Institute for Highway Safety (IIHS) and the National Safety Council issued guidelines to help ensure red light camera AE is used properly and equitably, and last year guidelines

⁹NTSB Most Wanted List Archives, https://ntsb.gov/safety/mwl/Pages/mwl_archive.aspx.

¹⁰IIHS, Study shows front crash prevention works for large trucks too, available at: <https://www.iihs.org/news/detail/study-shows-front-crash-prevention-works-for-large-trucks-too>; IIHS, Real world benefits of crash avoidance technologies, available at: <https://www.iihs.org/media/259e5bbd-f859-42a7-bd54-3888f7a2d3ef/e9boUQ/Topics/ADVANCED%20DRIVER%20ASSISTANCE/IIHS-real-world-CA-benefits.pdf>.

¹¹Robert Ferris, Cars on American roads keep getting older, CNBC (Sep. 28, 2021).

¹²U.S. DOT, National Roadway Safety Strategy, pg. 11 (Feb. 2022).

¹³*Id.*

¹⁴*Id.*

¹⁵IIHS, Safety groups create automated enforcement checklist to encourage well-designed programs (May 6, 2021).

¹⁶Pub. L. 117–58 (2021).

for speed enforcement AE were added.¹⁷ We encourage all localities to implement these recommendations. In addition, the IJA provides funding opportunities for states and localities to implement a Safe System Approach that seeks to prevent traffic fatalities by minimizing roadway conflicts and reducing crash forces when they do occur.¹⁸ This is accomplished through measures such as reducing speeds, road safety infrastructure improvements, vehicle safety enhancements and better post-crash management.

Development of AVs must be undertaken without jeopardizing public safety. Advocates spearheaded the development of the “AV Tenets,” policy positions which should be a foundational part of any AV policy.¹⁹ This comprehensive approach is based on expert analysis, real world experience, and public opinion and is supported by 60 stakeholders representing safety, consumer, public health, labor, bicyclists, pedestrians, individuals with disabilities, smart growth, and others. It has four main, commonsense categories including: 1) prioritizing safety of all road users; 2) guaranteeing accessibility and equity for all individuals including those with disabilities; 3) preserving consumer and worker rights; and, 4) ensuring local control and sustainable transportation. Many promises have been touted about AVs bringing reductions in motor vehicle crashes and resultant deaths and injuries, lowering traffic congestion and vehicle emissions, expanding mobility and accessibility, improving efficiency, and creating more equitable transportation options and opportunities. As Secretary Buttigieg recently acknowledged, these outcomes are far from certain.²⁰ The AV Tenets will be necessary if these goals are to be achieved, as well as mitigate potential negative consequences. Among the numerous recommendations in the AV Tenets, requiring that AVs meet minimum performance standards, including for cybersecurity, and that operations are subject to adequate oversight, including a comprehensive database accessible by vehicle identification number (VIN) with basic safety information, will be critical to putting safety first with regards to this technology.

QUESTION FROM HON. RODNEY DAVIS TO CATHERINE CHASE, PRESIDENT, ADVOCATES FOR HIGHWAY AND AUTO SAFETY

Question 6. What impact will AVs deployment have on the number of impaired driving crashes and fatalities?

ANSWER. If and when fully autonomous (SAE level four and five) vehicles (AVs) are developed and comprise the entirety of vehicles operated on U.S. roadways, the technology has the potential to reduce impaired driving crashes and the resulting fatalities. In 2020, according to the National Highway Traffic Safety Administration (NHTSA), 11,654 people died in crashes involving impaired driving across the nation.²¹ These crashes are 100 percent preventable, and technology can help eradicate impaired driving. In fact, the Insurance Institute for Highway Safety (IIHS) has released research showing that impairment detection systems could save upwards of 9,000 lives each year once widely deployed.²² Regrettably, impaired driving detection technologies currently are not required as standard equipment. However, the Infrastructure Investment and Jobs Act compelled the U.S. DOT to issue a final rule on advanced drunk and impaired driving prevention technology by November 2024.²³ Until these systems are standard equipment, additional safety technologies, such as automatic emergency braking (AEB), should be in all new vehicles subject to minimum federal performance standards. AEB can address a number of the conditions leading to crashes and can help to mitigate or prevent impaired driving collisions until such time as the systems noted above are in all vehicles.

QUESTIONS FROM HON. ERIC A. “ RICK” CRAWFORD TO CATHERINE CHASE, PRESIDENT, ADVOCATES FOR HIGHWAY AND AUTO SAFETY

Question 7. Your testimony states that, “According to the U.S. Department of Labor, truck driving is one of the most dangerous occupations in the United States”.

¹⁷ IIHS, New guidelines for automated enforcement programs emphasize safety amid rise in red-light-running crash deaths (Jul. 24, 2018)

¹⁸ *Id.*

¹⁹ See: <https://saferoads.org/autonomous-vehicle-tenets/>

²⁰ Nilay Patel and Andrew J. Hawkins, Pete Buttigieg is Racing to Keep Up with Self Driving Cars. *The Verge* (Jan. 6, 2022).

²¹ Stewart, T. (2022, March). Overview of motor vehicle crashes in 2020 (Report No. DOT HS 813 266). National Highway Traffic Safety Administration.

²² Insurance Institute for Highway Safety, Alcohol-detection systems could prevent more than a fourth of U.S. road fatalities (Jul. 23, 2020).

²³ Pub. L. 117–58 (2021).

How do you suggest we address the truck driver shortage? If truck-driving is dangerous, how would AVs improve safety by reducing human error?

ANSWER. The trucking industry is facing a retention crisis, not a driver shortage. The U.S. Department of Labor (U.S. DOL) has determined that “the labor market for truck drivers works about as well as the labor markets for other blue-collar occupations” and “a deeper look [at the truck industry labor market] does not find evidence of a secular shortage.”²⁴ Additionally, states issue more than 450,000 new commercial driver licenses (CDLs) each year demonstrating that there are candidates to fill vacancies.²⁵ Until the harsh and unsafe working conditions for interstate truck drivers are remedied, labor issues will persist. The Insurance Institute for Highway Safety (IIHS) has found that equipping large trucks with forward collision warning and automatic emergency braking (AEB) could eliminate more than two out of five crashes in which a large truck rear-ends another vehicle.²⁶ In addition, the National Transportation Safety Board (NTSB) has included increasing implementation of collision avoidance technologies such as AEB in its Most Wanted Lists of Transportation Safety Improvements since 2016.²⁷ The technologies can make operating a truck a safer job as well as improve safety for everyone driving on our nation’s roads.

Autonomous commercial motor vehicles (ACMVs) may in the future improve public safety but this potential remains far from certain. In fact, this technology still faces significant operational challenges such as responding to all participants in the transportation ecosystem including traffic control officers and vulnerable road users as well as differing weather conditions. While ACMV technology continues to be developed, advanced driver assistance systems (ADAS) should be required to immediately improve public safety.

Question 8. What are the national security implications and resulting safety impacts if China gains a leadership position in the global AV market?

ANSWER. Advocates for Highway and Auto Safety (Advocates) is a coalition of public health, safety, law enforcement and consumer organizations, insurers and insurance agents that promotes highway and auto safety through the adoption of federal and state laws, policies and regulations. Advocates’ mission is advancing safe vehicles, safe motorists and road users, and safe infrastructure. Issues involving national security and prognostications about the impact of China gaining a leadership position in the global AV market are outside our area of expertise.

QUESTION FROM HON. DAVID ROUZER TO CATHERINE CHASE, PRESIDENT, ADVOCATES FOR HIGHWAY AND AUTO SAFETY

Question 9. In North Carolina, as well as 15 other states, vehicles must undergo a periodic safety inspection to check items like brakes, tires, lights, etc. Autonomous vehicles will have all these features plus a more advanced system of sensors, software, and electronics. It is important that these vehicles be properly maintained from a safety perspective once they are on America’s highways.

How does your organization view state periodic vehicle inspection programs for autonomous vehicles?

ANSWER. Advocates supports annual vehicle inspections such as those required in North Carolina. Proper maintenance and inspection of autonomous commercial motor vehicles (ACMVs) is critical to ensuring the safe operations of these vehicles. The operation of trucks under an autonomous mode raises serious questions as to the ability to properly service vehicles continuously in use. Even without this potential new regime, 21 percent of CMVs were placed out of service in 2021 for maintenance issues.²⁸ In addition, many of the issues with the physical condition of the truck which would be identified by a human driver during a pre- or post-trip inspection as well problems during a trip such as the shift of a load or other emergencies noted by a human driver may not be identified or corrected under this type of use.

Advocates supported the proposal issued by the Federal Motor Carrier Safety Administration (FMCSA) in 2016 that would have required the annual state inspection of passenger carrying motor vehicles (the rulemaking was withdrawn in 2017) as

²⁴ United States Department of Labor, Bureau of Labor Statistics, Is the U.S. labor market for truck drivers broken? (Mar. 2019).

²⁵ Greg Rosalsky, Is There Really A Truck Driver Shortage?, National Public Radio (May 25, 2021).

²⁶ IIHS, Study shows front crash prevention works for large trucks too, available at: <https://www.iihs.org/news/detail/study-shows-front-crash-prevention-works-for-large-trucks-too>

²⁷ NTSB Most Wanted List Archives, https://ntsb.gov/safety/mwl/Pages/mwl_archive.aspx.

²⁸ FMCSA’s Motor Carrier Management Information System (MCMIS) data snapshot as of 12/31/2021. Available at: <https://ai.fmcsa.dot.gov/SafetyProgram/RoadsideInspections.aspx>

doing so would serve to better ensure that such vehicles are not transporting the public while in disrepair.²⁹ Current federal regulations require CMVs to undergo an inspection every 12 months and carriers may perform those inspections.³⁰ With the heightened safety concerns and complexities associated with ACMVs, requiring that the vehicles undergo an annual inspection performed by a properly trained state authority or independent party is prudent.

QUESTION FROM HON. RODNEY DAVIS TO NAT BEUSE, VICE PRESIDENT OF SAFETY,
AURORA

Question 1. With AV technology, the truck driver has less active engagement, but must remain attentive and be ready to step in if necessary.

Mr. Beuse, does Aurora use any technologies to address issues of driver attention and distraction?

ANSWER. Yes, at Aurora we employ a variety of processes, training protocols, and technologies for our vehicle operators to address issues of driver attention, fatigue, complacency, and distraction to support the overall safety of our operations while testing on public roads. We also adhere to industry best practices such as those published by AVSC, federal guidance issued by the U.S. DOT, and recommendations from the National Transportation Safety Board (NTSB).

The Aurora Driver is a Level 4 autonomous driving system (ADS). As defined by SAE, a Level 4 system is the hardware and software that are collectively capable of performing the entire dynamic driving task (DDT) on a sustained basis, regardless of whether it is limited to a specific operational design domain (ODD). Level 4 ADS systems are different from lower levels of autonomy that require humans to conduct the dynamic driving task. We are building the Aurora Driver through our development program which includes five stages: Lay the Foundation, Define and Build, Refine and Pilot, Validate, and Launch and Expand.¹ As I discussed with the Subcommittee during the hearing, we are in the Refine and Pilot stage for several of our partnerships, which includes on road testing with vehicle operators.

It is important to note that our vehicle operators play a key role in the development of self-driving vehicles and are essential to the collaboration between the safety, software, hardware, and product teams. Our vehicle operators play an integral role in the development of our technology and our overall approach to safe testing on public roads. They ensure safe vehicle testing and commercial operations, provide feedback to the development team, execute data collections for mapping and labeling, and represent the single biggest source of public interactions, since they are out in public with our vehicles.

Our vehicle operators are key to understanding and evaluating the performance of our self-driving system. They support the feedback loop for our developers by providing them with actionable insights and data from closed course and public road testing. Proper training, continuous education, and open lines of communication with our safety and engineering teams help ensure our vehicle operators are able to do their jobs safely, effectively, and efficiently. We also utilize the safety programs that are embodied in our Safety Management System to understand that our policies and programs are effective and appropriate for our road operations.

Policies and Technologies

Recognizing key distinctions between conventional driving and operating a developmental self-driving vehicle, we have implemented a number of technologies and policies for vehicle operators to assist with the safety of self-driving vehicle operations, which include but are not limited to collision avoidance features potentially included by OEMs, limiting cell phone and smartwatch use, and monitoring. Vehicle operators are strictly prohibited from interacting with their mobile devices and/or smartwatch while the vehicle is in motion or the self-driving system is engaged. All of our self-driving vehicles are equipped with a third-party driver monitoring system providing Aurora's operations management with the ability to maintain ELD/HOS compliance and review driver behavior and attentiveness. The system automatically identifies possible violations such as speeding, harsh braking events, seat belt usage, distracted driving, fatigue, and others. Trip data is periodically reviewed and triaged for coaching opportunities on sustained vigilance while operating or over-seeing the Aurora Driver on public roads.

²⁹ 81 FR 24769 (Apr. 27, 2016).

³⁰ 49 CFR 396.17.

¹ <https://aurora.tech/blog/the-aurora-driver-development-program-a-structured>

Training

Our vehicle operators are required to complete a comprehensive training program to prepare them to safely operate a self-driving vehicle and protect its surroundings and occupants from harm. As part of this intensive, multi-level training program, our vehicle operators must complete classroom assignments, undergo defensive-driver education, and be evaluated by driving with an instructor to confirm mastery of both basic and specialized driving skills. Our training program starts with safe manual driving training to ensure fluency and comfort operating vehicles equipped with non-standard technology features and physical equipment required for self-driving operations. This training begins on a closed course before proceeding to public road training. In order to move to the next level, vehicle operators must also have demonstrated acute situational awareness for potential nearby hazards, competence in conducting tests to confirm the safety of proposed changes in software, fluency with post-incident procedures, and mastery within each testing type. In addition to completing our rigorous training program (including recertification for qualified events), our truck operators must possess a valid Commercial Driver's License (CDL) in order to pilot a truck.

Please reach out to Melissa Froelich, [email address redacted], with any follow up.

QUESTION FROM HON. EDDIE BERNICE JOHNSON TO NAT BEUSE, VICE PRESIDENT OF SAFETY, AURORA

Question 2. While I was touring the Kodiak AV facility, we were briefed on how autonomous vehicle developers analyze their decision-making through a safety lens. I still have safety concerns with respect to this technology.

How can we work together to help ensure that all autonomous vehicle developers approach building this technology while maintaining safety first?

ANSWER. We strongly agree with the premise of this question: we can all work together to ensure safety across the AV industry and in turn improve safety on our roadways from the tragic loss of almost 40,000 Americans every year.

To drive the adoption of self-driving technology, we believe transparency and collaboration are critical. Sharing our own work and progress pushes forward the standards of safety for the entire AV industry; the transparency also ensures everyone, from regulators and partners to the general public, understands Aurora's safety approach and gives the rest of the industry tools to leverage in their own operations. Recent examples of this commitment to knowledge sharing include how we recently offered our perspective on standing up a Safety Management System (SMS) and unveiled our Safety Case Framework, as well as a Safety Case 101 on our blog.²

At Aurora, we approach safety as a continuous process, not a static checklist of to-do items, and our evidence-based approach is critical internally and externally. Within Aurora, our Safety Case Framework is how we continuously review evidence and evaluate the company and our operations, including the Aurora Driver's performance and development against internal standards to ensure we are confident putting self-driving vehicles on public roads both with and without a vehicle operator. Externally, our Safety Case Framework enables us to effectively share our approach and progress with partners, customers, regulators, and the general public. This transparency is imperative and helps us build trust, which we believe is vital when developing and eventually deploying our technology. We also encourage other AV developers to establish and publish their own safety case frameworks as a tool to improve public trust in the AV industry.

Industry standards bodies also play a critical role in establishing industry-wide best practices and common practices around safety critical issues. As I mentioned in my testimony, it is worth noting how far the industry has come in the last decade in the development of standards for AVs. In 2017, the U.S. Department of Transportation (USDOT) published AV 2.0, which lists exactly three standards (SAE J3016, ISO 26262, and MIL-STD-882E) that should be considered by automated driving system (ADS) developers. Fast forward to 2021, and USDOT's comprehensive plan now lists 20 different standards that automated driving system (ADS) developers should consider. And based on Aurora's involvement in industry standards development, we know there are over a dozen more standards and best practices currently under development across the various standards organizations. This work is critical to engage across the industry and various stakeholders to ensure it is actually utilized.

²See Aurora, "Aurora Unveils First-Ever Safety Case Framework that Addresses the Safety of Both Autonomous Trucks and Passenger Vehicles" (Aug. 17, 2021), <https://aurora.tech/blog/aurora-unveils-first-ever-safety-case-framework>; Aurora, "Welcome to Safety Case 101" (Mar. 8, 2022), <https://aurora.tech/blog/welcome-to-safety-case-101>.

We also see strength in the convening role of the government at all levels to support the safe development of AV technologies. There are tremendous opportunities for the federal government to continue supporting the development of AV technology in the United States to provide certainty that companies, including Aurora, need to continue investing and building here. Creating a level playing field where the rules are clear and conducive to realizing the benefits for safety, mobility, and efficiency for AV technology is a necessary role of government.

Aurora supports the work of Members of this Committee, Congress, and USDOT to ensure that laws and regulations for AVs are performance-based and technology and business-model neutral.

Federal regulatory leadership supporting the development of AV technology here in the United States is critical. The work that started many years ago at U.S. DOT under Secretary Foxx, continued under Secretary Chao, and carries through today under Secretary Buttigieg. USDOT's guidance, research, and rulemakings that have been initiated specific to AVs, along with the Department's use of its convening authority to bring stakeholders together, has laid the foundation for the future. We would like to thank Secretary Buttigieg for raising important safety issues in his six guiding principles for transportation innovation and in the "Comprehensive National Roadway Strategy." We also believe the U.S. DOT should be considering the full suite of potential solutions, including AVs, to address the rise in highway fatalities.

Finally, we support NHTSA's efforts to modernize the Federal Motor Vehicle Safety Standards (FMVSS), such as NHTSA's recent final rule for alternatively designed vehicles, and the Federal Motor Carrier Safety Administration's (FMCSA) efforts to modernize the Federal Motor Carrier Safety Regulations (FMCSR) to encourage the safe development of new and innovative AV technologies.

Please reach out to Melissa Froelich, [email address redacted], with any follow up.

QUESTION FROM HON. DAVID ROUZER TO NAT BEUSE, VICE PRESIDENT OF SAFETY,
AURORA

Question 3. In North Carolina, as well as 15 other states, vehicles must undergo a periodic safety inspection to check items like brakes, tires, lights, etc. Autonomous vehicles will have all these features plus a more advanced system of sensors, software, and electronics. It is important that these vehicles be properly maintained from a safety perspective once they are on America's highways.

How does your organization view state periodic vehicle inspection programs for autonomous vehicles?

ANSWER. Aurora complies with federal and state inspection requirements today in the states where we are operating, and we share the same strong interest in the safety of our vehicles on the road.

In addition, Aurora is working closely with the Commercial Vehicle Safety Alliance, and its members, including the North Carolina Highway Patrol, on the development of enhanced inspection protocols for AVs. As currently proposed, an enhanced pre-trip inspection model would transition en-route stops for random roadside inspections to structured, higher frequency, and higher standard inspections of autonomous commercial motor vehicles.

Please reach out to Melissa Froelich, [email address redacted], with any follow up.

QUESTIONS FROM HON. STEVE COHEN TO NAT BEUSE, VICE PRESIDENT OF SAFETY,
AURORA

Question 4. Mr. Beuse, can you share with this Committee what Aurora is learning about your technology from your pilot with FedEx and PACCAR?

ANSWER. We are thrilled to be in partnership with FedEx and PACCAR. This industry-first collaboration is born out of mutual trust and respect with industry leaders that share our vision to transform transportation and realize the benefits of self-driving technology. With PACCAR's Autonomous Vehicle Platform (AVP), we are creating a deeply integrated self-driving truck with a manufacturer that delivers hundreds of thousands of Class 8 trucks each year. And now, through this pilot, we are extending that partnership to a key customer, FedEx, to integrate those trucks into its massive network, which delivers billions of packages each year.

We are regularly and autonomously hauling FedEx loads with a vehicle operator between Dallas and Houston, a 500-mile round trip along the I-45 corridor that our autonomous semi-trucks travel day-and-night and with a 100 percent on-time record. Our pilot with FedEx and PACCAR demonstrates how we are progressing and advancing through the Aurora Driver Development Program as we are now in

the exciting phase of “Refine and Pilot.”³ In this phase, we build a handful of vehicles on which we will test, refine, and validate the requirements through on-road testing, virtual testing, and commercial pilots with networks, carriers, and private fleets. In our trucking pilots, we pull real loads in commercially representative ways to gain experience and incorporate customer feedback into the final product. Throughout this phase, we work closely with our platform partner to understand the full scope of customer preferences, even as they relate to non-autonomy-specific characteristics.

Question 5. In your testimony, you mention the importance of transparency and building trust with all stakeholders. What does that look like in your day-to-day work?

ANSWER. Trustworthy is one of the five principles of our Safety Case Framework because of its critical importance underpinning the whole of our work at Aurora. Aurora’s AV may be Proficient, Fail-Safe, Continuously Improving, and Resilient, but without the trust of the public and governmental regulators in our vehicles and company, we cannot fully realize our top level claim that Aurora’s self-driving vehicles are acceptably safe to operate on public roads.⁴ The Trustworthy principle addresses how Aurora plans to gain trust through public, government, and stakeholder engagement, safety transparency, safety culture, as well as external review and advisory activities.

While no day is the same in my role, my work to build trust and transparency with all stakeholders includes meeting with safety-focused advocacy groups, working with Aurora’s Safety Advisory Board,⁵ leading Aurora’s standards organization engagement, and supporting engagement with our federal and state regulators, including routinely publishing materials on many aspects of safety to share our progress and insights from that work.

Question 6. In your testimony you ask for performance-based law and regulations for AVs. As we are considering various policies to support AVs and improve safety on our roadways, what should we be aware of that would impact Aurora and FedEx’s ability to continue to do its work?

ANSWER. This is an incredibly important question at this time of Aurora’s development. In my testimony, I laid out several elements of any AV policy that would be important to Aurora’s continued work with partners, like FedEx, including that the policy contains performance-based and technology and business-model neutral requirements. Legislation or regulation that is counter to any of those principles could pose risk to our operations and partnerships and more broadly a risk to AVs being able to deliver on their promise to impact safety for the motoring public.

In my oral testimony, I described how Aurora is a regulated company at all levels of government and cited some of the many federal and state laws and regulations we are subject to as both a developer of AV technology and an operator of a fleet of autonomous trucks and passenger cars. For example, our AV technology is subject to the National Highway Traffic Safety Administration’s (NHTSA) motor vehicle safety requirements and oversight and our motor carrier operations are subject to Federal Motor Carrier Safety Administration safety regulations and oversight. In addition, each state in which we operate has its own approach to permitting and regulating our AV operations.

Current federal law, namely the Safety Act, federal regulations promulgated by NHTSA and FMCSA, state AV-specific regulations, and traditional tort and product liability law, provide the construct for Aurora’s duties and obligations as both a developer of AV technology and a tester and operator of AVs. Any fundamental change to NHTSA or FMCSA’s well-established authority and jurisdiction may raise compliance questions that could impair Aurora’s work with FedEx. For example, creating a bifurcated regulatory process at NHTSA for establishing safety standards for vehicles above and below 10,000 pounds that does not exist today, mandating industry adoption of specific types of technology, or restricting certain types of business-models would impede our current work.

Please reach out to Melissa Froelich, [email address redacted], with any follow up.

³ Aurora, “The Aurora Driver Development Program: A Structured Approach for the Creation of Aurora-Powered Vehicles” (Sept. 10, 2021), <https://aurora.tech/blog/the-aurora-driver-development-program-a-structured>.

⁴ See Aurora, “Aurora Unveils First-Ever Safety Case Framework that Addresses the Safety of Both Autonomous Trucks and Passenger Vehicles” (Aug. 17, 2021), <https://aurora.tech/blog/aurora-unveils-first-ever-safety-case-framework>; Aurora, “Welcome to Safety Case 101” (Mar. 8, 2022), <https://aurora.tech/blog/welcome-to-safety-case-101>.

⁵ Aurora, “Our Updated Safety Report and First-Ever Safety Advisory Board” (June 2, 2021), <https://aurora.tech/blog/aurora-shares-safety-report>.

QUESTION FROM HON. EDDIE BERNICE JOHNSON TO DOUG BLOCH, POLITICAL
DIRECTOR, JOINT COUNCIL 7, INTERNATIONAL BROTHERHOOD OF TEAMSTERS

Question 1. Thank you, Mr. Bloch, for highlighting a provision that I fought to include in the INVEST Act regarding workforce retraining. As you can imagine, I was more than disappointed the Senate deleted this language from the final bill.

Would you be able to expand on what kinds of programs you would like to see when you mention “workforce retraining programs for surface transportation workers whose jobs have been affected by automation”?

ANSWER. While the impact that Automated Vehicles (AVs) will have on transportation workers is not yet fully known, the development and testing of AVs that has occurred so far has given us a look into the future and a degree of certainty that current workers will need to be retrained and up-skilled to remain in what will eventually be a fast-changing workplace. The most important step that Congress can take is to ensure that workforce development plans are in place and implemented before workers begin to be replaced or lose their jobs altogether to automation. Your *Surface Transportation Workforce Retraining Grant Program* is the kind of forward-thinking policy that could go far in mitigating these impacts to workers before they happen.

All too often, assistance to workers that lose their jobs to automation comes after the fact. Most cannot afford to give up a paycheck to attend a trade school, college classes or other forms of education full time to learn a new skill. I noted in my oral testimony to the Committee that when Campbell’s Soup closed its Sacramento canneries, the government swooped in to provide job training assistance, but in one representative case, it took a worker three years to learn to become an ultrasound technician and find a job. In the interim, this worker experienced extreme financial hardship. We can and must do better!

Financial grants, as in your proposal, must be tied to workforce development programs that are aimed at retraining/up-skilling workers while they are in their current jobs. It cannot be a secret to manufacturers developing the technology to produce self-driving vehicles what their workforce needs will be in the future and how their current employees need to be trained to transition to those new jobs. Instead of giving a worker a pink slip, give them an opportunity to learn new skills. Labor-management partnerships, pre-apprenticeship and registered apprenticeship programs are all proven ways to create the types of workforce retraining programs that lead to real up-skilled jobs. And most importantly, there needs to be a component in any workforce development plan that places an emphasis on timely job placement, should there be a need for employment with new company.

The Teamsters Union does not foresee a time when human intervention will not be part of the protocol in the operation of Commercial Motor Vehicles (CMVs). Therefore, for Level 3.4 and 5 autonomous vehicles, we see an opportunity to develop driver training programs that recognize new driver skills needed to oversee the advancing technology that will allow periods of vehicle self-driving, recognize and diagnose warning signals, and prepare to take over driving tasks if and when the autonomous driving systems malfunction or a need for other human intervention. We also envision training programs that would allow mechanics to upskill to meet the demands of automation, trading in their wrenches for computerized diagnostic tools that could detect problems with self-driving components. These are but a few of the examples that come to mind.

It has been estimated by various sources that between 2.2 and 3.1 million car, bus and truck driving jobs in the U.S. would be eliminated by the advent of self-driving vehicles. While that may be a staggering prediction, we must be prepared to make a transition no matter how many workers are affected. Thank you for taking such an interest in making sure that workers are not left behind in this race to deploy automated vehicles.

QUESTION FROM HON. PETER A. DEFAZIO TO NICO LARCO, AIA, DIRECTOR AND
PROFESSOR, URBANISM NEXT CENTER, UNIVERSITY OF OREGON

Question 1. Dr. Larco, your testimony describes how policymakers and the public should prepare for AVs not just focusing on the technology, but based on the societal impacts of AVs. AVs have the potential to expand mobility options for the traveling public and, in turn, may have a significant effect on travel behavior.

Dr. Larco, how do you envision AVs fitting into the larger portfolio of mobility options, including ride-share and public transit?

ANSWER. It is important to frame the answer to this question in the context of societal and community goals. Nothing says we absolutely *need* to have AVs as part of our transportation future. Instead, this should only happen if AVs improve societal goals such as safety, livability, sustainability, and equity. Our transportation

system—including a future system that may include AVs—should be designed and optimized to increase safety, increase equitable mobility, increase accessibility, and reduce GHG emissions while moving people and goods.

One thing that is becoming clear is that the best way to achieve these goals is probably not through a transportation system based primarily on individually owned or individually utilized AV cars and trucks. Studies have shown that this will increase congestion and vehicle miles travelled. Instead, one of the most effective ways to achieve safety, livability, sustainability, and equity goals is to make low-carbon options, walking, biking, and taking transit, the easiest way for people to travel. AVs that help support these modes can absolutely benefit communities. For example, AV technology applied to transit could help increase transit frequency and coverage. AV shuttles might pick-up and drop-off passengers at high-capacity transit stations thereby supporting transit use while addressing first/last mile issues. In some cases, in less dense areas, AV sedans might be used to serve areas not easily served by transit, but if we are to achieve the goals described above, this should be the exception, not the rule.

The risk is that we replace our personally-owned vehicles with an autonomous vehicle, increasing the number of vehicles (both with and without passengers) on the road and resulting in a large rise in congestion (Green et al., 2019). I worry about a world of privately owned AVs—or one dominated by rideshare AVs—that exacerbate many of our existing transportation challenges while also creating the problematic cascading impacts I discussed in my written and oral testimony.

QUESTIONS FROM HON. HENRY C. “HANK” JOHNSON, JR. TO NICO LARCO, AIA,
DIRECTOR AND PROFESSOR, URBANISM NEXT CENTER, UNIVERSITY OF OREGON

Question 2. There’s a perception that AVs are inherently greener and reduce greenhouse gas emissions, but that ignores the Jevons Paradox—that as driving becomes less of a hassle, more people will drive. This could cause people to take more and longer trips leading to increased emissions, and tire and road erosion. In my district outside of Atlanta, which struggles with urban sprawl, this would also result in greater congestion and delays. As we know, the phenomenon of induced demand has shown it is not possible to widen roadways to solve congestion.

Mr. Larco: How can we ensure AVs do not incentivize additional sprawl and congestion?

ANSWER. Throughout history, any increase in the ease of travel that did not come about without some means of control has resulted in the expansion of the metropolitan footprint and sprawl. While this has facilitated the development patterns and lifestyles we see in suburbia, it has also come at a cost to our environment and to equity. There are four approaches communities can use to limit AVs incentivizing of sprawl and congestion.

1. *Create controls that increase the friction of unfettered AV travel.* Price signals are an effective way to incentivize behavior. If communities want to limit the number of vehicles driving long-distances, then a road usage charge (RUC) or vehicle miles traveled (VMT) tax is one method to both increase the cost of sprawling development and reducing congestion.
2. *Build and locate housing, jobs, schools, and shopping closer together.* If communities don’t want to encourage people to live on the metropolitan fringe, they must provide housing and employment at closer in locations. Land use is a critical component of reducing sprawl and congestion. Too many communities across the U.S. have made it difficult to build additional housing as they restrict missing middle housing such as duplexes, triplexes, and fourplexes.
3. *Improve walking, biking, and taking transit.* Land use and transportation planning work hand-in-hand. If communities want to reduce sprawl and congestion, then they must design and build communities with housing, jobs, schools and shopping closer together and make it easy, safe, and affordable to walk, bike, e-scooter, or take transit.
4. *Constrain residential expansion into rural areas.* Finally, if communities want to reduce sprawling development into rural areas, they can make it more difficult to develop in these areas while making development closer in easier and more profitable. Oregon has done that by requiring every city to adopt an Urban Growth Boundary (UGB) and restricting the types of development that can occur outside of UGBs.

Question 3. Mr. Larco: How can climate effects be minimized if Americans continue to rely on cars—AVs or otherwise—as their primary mode of transportation?

ANSWER. History suggests it will be challenging, if not impossible, to reduce GHG emissions if Americans continue to rely on cars as their primary mode of transportation. Historically, we have increased our vehicle miles travelled faster than we

have improved fuel efficiency, leading to a continued increase in GHG emissions since automobiles were first mass produced in this country. The best scenario, if we continued our reliance on cars, would be to have a fully electrified fleet that is fueled solely by energy from renewable sources. Achieving this would require overcoming significant technological hurdles as well as significant political and market barriers. Even in this scenario, however, there is no guarantee that GHG emissions would be reduced to the levels necessary to curtail climate effects as the lifecycle costs of electric vehicles (the energy and environmental effects of its manufacturing/production) result in substantial GHG emissions (Andersson & Börjesson, 2021; Hawkins et al., 2013). Less energy intensive modes such as transit, biking, and walking continue to be the preferred solution to our climate concerns around transportation.

I will also mention that energy and GHG emissions are not the only concern of our continuing to have a car-dominated transportation system and, more specifically, if we continued to promulgate land use and development patterns that force us to use cars (namely sprawl). Even if cars themselves were GHG and energy neutral, we would still have the problems of continued land consumption, disruption and degradation of natural water systems, disruption and degradation of critical ecologies, and a continued increase in inequities.

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This testimony was prepared by Nico Larco, Becky Steckler, and Amanda Howell of the Urbanism Next Center at the University of Oregon.

Urbanism Next Center—<http://urbanismnext.org/>

QUESTIONS FROM HON. EDDIE BERNICE JOHNSON TO ARIEL WOLF, ESQ., GENERAL COUNSEL, AUTONOMOUS VEHICLE INDUSTRY ASSOCIATION

Question 1. Mr. Wolf, given that many autonomous truck companies expect to begin commercial deployment within the next few years, I am wondering in what ways the industry is working to ensure that our workforce is prepared to be a part of this workforce and equipped with the necessary skill sets to fill new roles created by AV technology?

ANSWER. The autonomous vehicle (“AV”) industry has already added jobs in regions where it is most active. A study performed for the Pittsburgh-based Regional Industrial Development Corporation found that in the Pittsburgh region alone, the AV industry has created 6,500 new jobs.¹ The AV industry is providing opportunities for workers with a wide array of expertise and educational backgrounds, including many jobs that do not require a college degree. Today, in locations across the country, AV developers and manufacturers are hiring auto technicians, fleet managers, safety operations specialists, sensor calibrators, transportation planners, engineers, and many others to support the testing and deployment of AV technology. As the AV industry continues to expand, delivery workers and grocery store employees will be involved in selecting, packing, and delivering goods to consumers, among other jobs and roles that will emerge. AVs can expand access to affordable delivery while also creating over three million new jobs by 2035, as retailers and delivery providers expand their services, according to a study by Steer.²

The AV industry is investing in partnerships to create the workforce needed to support the widespread deployment of AVs. For example, Nuro’s program with De

¹ TEConomy Partners, *Forefront: Securing Pittsburgh’s Break-out Position in Autonomous Mobile Systems ES-1-2* (2021), <https://ridc.org/wp-content/uploads/2021/10/PGH-Autonomy-Report-Executive-Summary.pdf>.

² Steer, *Economic Impacts of Autonomous Delivery Services in the U.S. XV* (2020), https://www.steergroup.com/sites/default/files/2020-09/200910_%20Nuro_Final_Report_Public.pdf.

Anza Community College will offer a new career pathway to prepare the next generation of autonomous fleet technicians.³ The initiative, which will extend to more locations in the near future, includes a free tuition option, access to paid internships and part time work, and preference for full-time and full benefits jobs upon graduation. Another example is TuSimple's work with Pima Community College, which established an AV certificate program to prepare drivers for new jobs such as training AV systems as test drivers, operating the AV in situations where autonomous driving is not always suitable, and remotely monitoring the system from a command center.⁴ In San Francisco, Cruise partners with a local non-profit organization, Humanmade,⁵ to help build bridges between historically underserved communities and the advanced manufacturing economy through skills training, education, access to advanced tools and machinery, interview workshops, and other resources.

Question 2. While I was touring the Kodiak AV facility, we were briefed on how autonomous vehicle developers analyze their decision-making through a safety lens. I still have safety concerns with respect to this technology.

How can we work together to help ensure that all autonomous vehicle developers approach building this technology while maintaining safety first?

ANSWER. The Autonomous Vehicle Industry Association's ("AVIA") members are dedicated to the safe development and deployment of AV technologies. One of the most important benefits of AV adoption is the safety improvements the technology offers when compared to human drivers. AV developers have publicized their safety policies and development strategies in public reports to help the public understand how developers are placing safety at the forefront of their programs.⁶ One important action that Congress can take to help ensure the continued safe deployment of AVs is to provide a clear regulatory framework. With the regulatory certainty provided by such a framework, AV developers would be better positioned to expand AV testing and deployments, which would provide data and experience that can help refine AV technology and enhance its already significant safety capabilities, while also allowing the safety and mobility improvements offered by AVs to be utilized by communities across the country.

Question 3. Mr. Wolf, how can autonomous trucking help to relieve supply chain backlogs, especially at ports and in districts like mine that serve as freight and logistics hubs? And how can we prepare those regions for the changes that autonomous trucking will bring?

ANSWER. AV trucks can increase long-haul efficiency and capacity, which will in turn improve the efficiency of freight and logistics hubs along with countless other industries that rely on moving goods on trucks, such as agriculture, retail, and manufacturing. By supplementing human drivers and increasing the time vehicles can spend on the road, goods can be moved from port and freight hubs to final destinations with greater speed and efficiency, cutting down the time it takes to transport goods.

Importantly, AV trucks will be part of a comprehensive trucking ecosystem that works with human drivers, not against them. Adoption of this technology can lead to a positive lifestyle change for thousands of truck drivers, allowing them to stay closer to home during the day instead of driving routes that keep them on the road for weeks at a time. A recent study funded by USDOT and the Federal Highway Administration also indicated that adoption of AV trucking will increase total U.S. employment by 26,400 to 35,100 jobs per year on average and raise annual earnings for all U.S. workers by between \$203 and \$267 per worker per year.⁷ Given the timeline for AV truck deployment, autonomous trucking is not likely to cause significant displacement of jobs in the trucking industry,⁸ but it can serve as one tool

³ *Autonomous and Electric Vehicle Technician Pathway*, De Anza College, <https://www.deanza.edu/autotech/av#:~:text=A%20New%20Career%20Pathway%20With,nation%20%E2%80%94%20for%20De%20Anza%20students> (last visited Jan. 28, 2022).

⁴ Linda Baker, *TuSimple and Pima Community College Launch First-Ever AV Certificate Program for Truck Drivers*, Freightwaves (June 13, 2019), <https://www.freightwaves.com/news/tusimple-and-pima-community-college-launch-first-ever-av-certificate-program-for-truck-drivers>.

⁵ *Workforce Development Programs*, Humanmade, <https://www.humanmade.org/workforce-development> (last visited Mar. 13, 2022).

⁶ A few of the companies that have published safety reports include Waymo, Aurora, TuSimple, and Nuro.

⁷ Robert Waschik et al., John A. Volpe Nat'l Transp. Sys. Ctr., *Macroeconomic Impacts of Automated Driving Systems in Long-Haul Trucking* (2021), <https://rosap.ntl.bts.gov/view/dot/54596>.

⁸ See *Securing America's Future Energy, America's Workforce and the Self-Driving Future: Realigning Productivity Gains and Spurring Economic Growth* (June 2018), <https://>

to reduce strains on the supply chain caused, in part, by the longstanding truck driver shortage.

QUESTIONS FROM HON. RODNEY DAVIS TO ARIEL WOLF, ESQ., GENERAL COUNSEL,
AUTONOMOUS VEHICLE INDUSTRY ASSOCIATION

Question 4. During the hearing, you highlighted the safety record of autonomous vehicles (AVs), however, there was some disagreement among panelists on this topic. One panelist cited a statistic which states that 9.1 accidents occur for every million miles traveled by an AV, while only 4.1 accidents occur per million miles traveled by a human driver.

How do you respond to claims that AVs are less safe than human drivers, specifically the rate of accidents per million miles?

ANSWER. The statistic referenced comes from a study on AV crashes that was produced in the fall of 2015, when the AV industry was considerably smaller. The final statistics in that study were generated from a data set that included 11 total crashes over a 4-year period and in each of those 11 crashes, the drivers of the conventional vehicles involved were found to be at fault.⁹ By comparison, the California Department of Motor Vehicles (“DMV”) reported that AVs drove four times as many miles on that state’s roads in 2021 alone than during that entire 4-year period studied.¹⁰ The AV industry and AV technology has developed significantly in the last decade, and research shows that even when an AV cannot avoid a collision, they are better able to reduce the severity of a crash when compared to a human driver.¹¹

When considering comparisons between AVs and traditional vehicles, it is also important to note that AVs are often monitored much more closely, both by AV developers and by federal and state regulators. California requires AVs to report any collision that resulted in property damage, bodily injury, or death within ten days of an incident,¹² while NHTSA’s Standing General Order 2021–01 (“SGO”) requires reports within one day for some serious incidents and monthly reports for minor crashes.¹³ This is not true for incidents involving traditional motor vehicles, with a 2015 NHTSA study estimating that approximately 30% of crashes go unreported.¹⁴

Question 5. How can autonomous trucking help to relieve supply chain backlogs, especially at ports?

ANSWER. AV trucks can increase long-haul efficiency and capacity, which will in turn improve the efficiency of freight and logistics hubs along with countless other industries that rely on moving goods on trucks, such as agriculture, retail, and manufacturing. By supplementing human drivers and increasing the time vehicles can spend on the road, goods can be moved from port to freight hubs, to final destinations with greater speed and efficiency, cutting down the transportation times of goods. This will allow for a more efficient flow of goods into and out of ports, easing congestion and backlogs. AVs can also move goods within a port, assisting port workers in managing materials and helping prevent backlogs.

Question 6. You mentioned in your testimony that deployment of AVs can expand mobility for seniors and people with disabilities, is a regulatory framework necessary to maximize these benefits?

ANSWER. A regulatory framework for AVs that enhances public trust in AV technology, maximizes AV deployments, and promotes innovation will help ensure that

avworkforce.secureenergy.org/wp-content/uploads/2018/06/Americas-Workforce-and-the-Self-Driving-Future-Realizing-Productivity-Gains-and-Spurring-Economic-Growth.pdf.

⁹ Brandon Schoettle and Michael Sivak, A Preliminary Analysis of Real-World Crashes Involving Self-Driving Vehicles (2015), <http://websites.umich.edu/~umtriswt/PDF/UMTRI-2015-34.pdf>.

¹⁰ Press Release, Cal. Dep’t of Motor Vehicles, AV Permit Holders Report 4 Million Test Miles in California (Feb. 9, 2022), <https://www.dmv.ca.gov/portal/news-and-media/av-permit-holders-report-4-million-test-miles-in-california/>.

¹¹ John M. Scanlon, et. al., Waymo Simulated Driving Behavior in Reconstructed Fatal Crashes within Autonomous Vehicle Operating Domain (2021), <https://storage.googleapis.com/waymo-uploads/files/documents/Waymo-Simulated-Driving-Behavior-in-Reconstructed-Collisions.pdf>.

¹² *Autonomous Vehicle Collision Reports*, Cal. Dep’t of Motor Vehicles, <https://www.dmv.ca.gov/portal/vehicle-industry-services/autonomous-vehicles/autonomous-vehicle-collision-reports/> (last visited Mar. 13, 2022).

¹³ Nat’l Highway Traffic Safety Admin., U.S. Dep’t of Transp., First Amended Standing General Order 2021–01 (Aug. 5, 2021), <https://www.nhtsa.gov/sites/nhtsa.gov/files/2021-08/First-Amended-SGO-2021-01-Final.pdf>.

¹⁴ Nat’l Highway Traffic Safety Admin., DOT HS 812 183, National Telephone Survey of Reported and Unreported Motor Vehicle Crashes, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812183>.

everyone can enjoy the benefits of AV technologies, including expansion of safe and affordable transportation. A clear regulatory framework would encourage AV deployment across the country, rather than having to target scaled deployments to only those states that have created regulatory environments authorizing AV deployments. The 25.5 million Americans with travel-limiting disabilities do not live only in states like Arizona, Nevada, or Texas where there are established paths to widespread AV deployment. A framework that allows for deployments nationwide will expand opportunities for millions of those people to access the mobility benefits offered by AVs.

QUESTION FROM HON. ERIC A. “RICK” CRAWFORD TO ARIEL WOLF, ESQ., GENERAL COUNSEL, AUTONOMOUS VEHICLE INDUSTRY ASSOCIATION

Question 7. You stated in your testimony that the United States leads the world in AV technology, but is in danger of ceding the lead to other countries who are developing a framework for deploying AVs.

What type of competitive advantage does leading the world on AVs give the United States? What does the United States risk by ceding the lead?

ANSWER. As the center of global AV development, the United States is poised to lead in a global market for AVs worth an estimated \$1 trillion by the latter half of this decade.¹⁵ America’s leadership role is integral to securing the economic growth, job creation, and many safety and societal benefits offered by AVs. If the U.S. can maintain its lead in AV deployment, American automakers and AV developers can create and export valuable gold standard AV technologies to markets across the world. U.S. leadership in AV development and deployment also means the significant mobility and safety benefits of AV technology can be more easily shared among all Americans, as communities and consumers can purchase and benefit from domestically produced vehicles and technologies.

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¹⁵TECEconomy Partners, supra note 1 at ES-1-2 (2021).